

EMERGENCY DRUG DOSING IN CHILDREN:

A resuscitation aid for
paediatric emergencies

Mike Wells
Lara Goldstein
Martin Botha

ELSEVIER HANDBOOK SERIES



EMERGENCY DRUG DOSING IN CHILDREN

Mike Wells

This book is dedicated to my children Terran and Calleigh, as well as to all children like them who might one day be dependent on somebody's expertise in paediatric emergency care.

Lara Goldstein

This book is dedicated to my only inspiration ... for always including me and motivating me to do more.

Martin Botha

Dedicated to the Lord God Almighty, my dear wife Dawn and my wonderful sons, Eythan and Joshua.

EMERGENCY DRUG DOSING IN CHILDREN:

A resuscitation aid for paediatric emergencies

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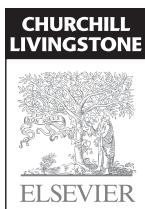
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Edinburgh London New York Oxford
Philadelphia St Louis Sydney Toronto 2012

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ISBN 978 0 702 046391

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data

A catalog record for this book is available from the Library of Congress

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Preface

*I must not fear.
Fear is the mind-killer,
The little death that brings total obliteration.
I will face my fear,
I will permit it to pass over me and through me.
And when it has gone past I will turn the inner eye to see its path.
Where the fear has gone there will be nothing.
Only I will remain.*

Bene Gesserit, 'Litany Against Fear'

From Frank Herbert's *Dune* series © 1965 and 1984 Frank Herbert.

Published by Putnam Publishing Group

Before everything else, getting ready is the secret of success.

Henry Ford, American businessman

If you're not prepared, it's not pressure you feel, it's fear.

Bruce Bochy (American baseball coach)

What I do is prepare myself until I know I can do what I have to do.

Joe Namath (American football quarterback)

So why write (or buy for that matter) a book about emergency drug dosing in children? And what does emergency drug dosing mean anyway? And what on earth does a quotation about fear have to do with paediatric emergencies? Well, the answer finds its roots in several major factors that influence the dynamics of managing paediatric emergencies:

- **Fear** Many doctors are uncertain or even afraid of managing critically ill or injured infants and children. Whether this is from unfamiliarity with treating children or for other reasons, the uncertainty or fear will result in poorer and slower decision-making and poorer execution of tasks. This 'paralysis by indecision' is potentially harmful to children and is at least in part due to uncertainty about paediatric equipment, drug doses and drug dose calculations.
- **Preparation** Most health care providers do not realize that one of the main aspects of emergency medicine practice (or any discipline that encounters critical or emergent presentations) is *a priori* preparation. It is well-known in the fields of sport and business that preparation is essential, but medical personnel often seem to have escaped this insight. It is irresponsible and negligent to be in a position where you might encounter paediatric emergencies and be unprepared.
- **Resuscitation aids** Traditional medical education has erroneously inculcated in doctors certain knowledge and attitudes that adversely affect their ability to manage paediatric emergencies effectively. Doctors are taught to memorize information and to rely on that memory in clinical practice. This is contradicted by contemporary evidence in emergency medicine that shows that the cognitive load of paediatric resuscitation easily leads to errors and potential patient harm – through errors in action or from delay in performing

ACKNOWLEDGEMENTS

We gratefully acknowledge the input of Dr Walter Kloeck for his comments on this material during its early development. The paediatric ECG charts were developed by Dr M Wells and Dr W Kloeck.

Abbreviations

%BSA	percentage burn surface area
½ DD	Half-strength Darrow's with 5% dextrose solution
ABW	adjusted body weight
AED	automated external defibrillator
AG	anion gap
AHA	American Heart Association
ALIR	acute lung injury ratio
ALS	advanced life support
AMI	acute myocardial infarction
AS	aortic stenosis
ASA	American Society of Anaesthesiologists
ASB	assisted spontaneous breath
ASD	atrial septal defect
ASN	age-specific normal
AV	atrioventricular
AVB	atrioventricular block
AVCD	atrioventricular canal defects
BD	twice a day
BIG	bone injection gun
BMI	body mass index
BOPS	behavioural observational pain scale
BP	blood pressure
BSA	body surface area
Cl⁻	serum chloride
cmH₂O	centimetres of water at 25°C
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CVC	central venous catheter
D25W	25% dextrose water
D50W	50% dextrose water
D5W	5% dextrose water
DBP	diastolic blood pressure
DDAVP	1-deamino-8-D-arginine vasopressin
ECC	emergency cardiovascular care
ECG	electrocardiogram
ED	emergency department
EDDC	emergency drug dosing in children
EEG	electroencephalogram
ETT	endotracheal tube

Abbreviations

EU	European Union
FFP	fresh frozen plasma
F_iO₂	fraction of inspired oxygen
Fr	French gauge
G6PD	glucose-6-phosphate dehydrogenase
GABA	gamma aminobutyric acid
GCS	Glasgow Coma Scale
GIT	gastrointestinal tract
Hb	haemoglobin
HCM	hypertrophic cardiomyopathy
HCO₃	bicarbonate
HME	heat-moisture exchanger
Ht	height
I:E	ratio of inspiration to expiration
IART	intra-atrial re-entry tachycardia
IBW	ideal body weight
ICP	intracranial pressure
ICU	intensive care unit
ID	internal diameter
IJV	internal jugular vein
IM	intramuscular
INR	international normalised ratio
IO	intraosseous
IV	intravenous
K⁺	potassium
KCl	potassium chloride
kPa	kilopascal
LA	left atrium
LAD	left axis deviation
LBBS	left bundle branch block
LV	left ventricle
LVH	left ventricular hypertrophy
m/v	mass per volume
MAP	mean arterial pressure
mbar	millibar (equal to hectopascal)
mmHg	millimetres of mercury
MV	minute ventilation
Na⁺	sodium
NAC	N-acetylcysteine
NS	0.9% normal saline
NSAID	non-steroidal anti-inflammatory drug
OD	once a day
OD	overdose
ORT	oral rehydration therapy
PAC	premature atrial complex

PaCO₂	partial pressure of carbon dioxide in arterial blood
P_aO₂	partial pressure of oxygen in arterial blood
PDA	patent ductus arteriosus
PE	phenytoin equivalent
PEA	pulseless electrical activity
PEEP	positive end expiratory pressure
PEFR	peak expiratory flow rate
PIP	peak inspiratory pressure
PIP-TAZO	piperacillin/tazobactam combination
PJC	premature junctional complex
PNGT	per nasogastric tube
PO	per os (by mouth)
PR	per rectum
PS	pressure support
PSA	procedural sedation and analgesia
PSI	pounds per square inch
PVC	premature ventricular complex
QID	four times a day
RA	right atrium
RAD	right axis deviation
RBBB	right bundle branch block
RL	ringer lactate solution
ROSC	return of spontaneous circulation
RR	respiratory rate
RSI	rapid sequence intubation
RV	right ventricle
RVH	right ventricular hypertrophy
SA	sino-atrial
SBP	systolic blood pressure
SQ	subcutaneous injection
SVT	supraventricular tachycardia
TAPVD	total anomalous pulmonary venous drainage
TBW	total body weight
TCA	tricyclic antidepressant
TGV	transposition of the great vessels
TOF	tetralogy of Fallot
VF	ventricular fibrillation
VSD	ventricular septal defect
VT	ventricular tachycardia
vWD	von Willebrand disease
vWF	von Willebrand factor
WFI	water for injection
WPW	Wolff-Parkinson-White syndrome
Wt	weight

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How to use this book

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Preparation before using the book	1	Guide to using the antimicrobial dose tables	4
Guide to using the bolus drug dose tables	2	Using the Broselow® tape and the PAWPER tape	5
Guide to using the emergency infusion tables	3		

PREPARATION BEFORE USING THE BOOK

If the first time that you open the book is when you are using it for an emergency then you have missed the point: preparation is essential for effective emergency medical management! Please go through the following list to make sure that you understand the philosophy of how the book was created so that you can use it correctly and adapt it where necessary.

- Verify all the information that has been presented and familiarize yourself with the layout of the book! If you have checked it yourself you will have learnt a lot about emergency drug doses and reassured yourself that the content is sound (we really hope you don't find any errors).
- Check which doses have been presented, as a higher or lower dose may be appropriate for different clinical scenarios. In general the most commonly used dose that is known to be effective has been selected, or one that is found in a high-profile source. If a drug has more than one use, such as agents employed in procedural sedation for example, make sure that you know which dose is to be found in the EDDC book. We encourage you to read up on the doses and agents contained in this book as they all form a core part of paediatric emergency practice.
- Check which formulation has been used for the dilution. This is a perennial problem as comprehensive paediatric formularies do not exist. If your local preparation differs from the one that we have used then be sure to note the necessary changes in your book.
- Use the Broselow® tape or PAWPER tape (see p. 5) to determine the patient's weight. Flip to that weight section in this book: everything that is needed will be on those pages, from drug doses to equipment sizes to information for emergency infusion initiation. Everything is alphabetical to help making navigating around the book easier.
- Make sure that you have read the pharmacology chapter in this book so that you can decide how best to tailor or adapt your drug doses based on age as well as body weight (total/ideal/adjusted body weight or according to the age of your patient).
- Select the drug or equipment that you need and read off the dose or size. If you have an accurate weight, then use that weight as the reference. It may be necessary to interpolate between doses if a patient's weight falls between the reference weights in the book. If you are not sure how to interpolate then read the following examples. In general,

however, the reference weights have been selected such that there is a small increase in volume to administer (such as 1 mL).

This book has the drug doses for children weighing 16 kg and 18 kg but not for a child weighing 17 kg. If, for example, the dose of atropine is required for a 17 kg child, this needs to be interpolated. The dose of atropine is 3 mL for a 16 kg child and 3.5 mL for an 18 kg child. The interpolated dose for a 17 kg child would thus be 3.25 mL which would be rounded up to 3.3 mL.

- As a general rule give all medications slowly unless there is a specific reason not to (such as with adenosine)! Some drug doses may need to be repeated for appropriate clinical results. Monitor the effect and move on to the next appropriate management step.
- Keep the book with you whenever it might be needed – it will do you no good if it is in your car/your bag/your study and you are up to your elbows in trouble in the ED, ICU or paediatric ward.
- This book is meant to provide assistance to a TEAM and not just the doctor, so make sure that your team knows how to use it too. This applies especially to the team members who will be preparing and administering the drug dilution.

GUIDE TO USING THE BOLUS DRUG DOSE TABLES

See Fig. 1.1:

1. Turn to the page of the book with the correct weight, or the closest weight if that exact weight is not presented. Whether you use the closest higher or lower weight depends on the drugs you wish to use, but in general use the closest higher weight to ensure that the dose that you administer is effective. Interpolation may be necessary at the higher end of the weight spectrum.
2. This is the generic drug name, with an indication of the route of administration if more than one is presented.
3. This is the dose that was selected to be presented in this book because it was considered to be the most appropriate and the safest to ensure efficacy while avoiding overdosage or toxicity.
4. This is the suggested dilution of the drug to provide a manageable volume to administer accurately: this has to be a balance between too much volume (especially for infants less than 10 kg) and too much 'fiddling' required. The milligrams per ampoule or vial as well as the volume in the ampoule or vial are reflected, with the amount of diluent to be added. Drugs in powder form may be required to be diluted with

1	3	8		
3kg	3kg	3kg	3kg	3kg
Medication	Syringe (mL)	Preparation		mL
Adenosine 1 st dose 0.1mg/kg	1 10	6mg/2mL + 4mL dil. (1mg/mL)		0.3
2	7 6	4	5	

Fig 1.1 A sample section of the bolus drug panel.

a special diluent or may be dissolved directly into normal saline, water for injection or 5% dextrose water. Most drugs can be diluted into any of these solutions, but some manufacturers recommend specific diluents (e.g. dextrose water for amiodarone). In a true emergency any diluent may be used.

5. This is the final strength of the drug dilution. This value allows for easy cross-checking to ensure that correct doses are administered. It also allows for alternative dilutions with different preparations as long as the final dilution is the same.
6. This is the size of the syringe needed to prepare the diluted drug solution. The volume of the final solution does not always fill the syringe, however.
7. For smaller children a 1 mL syringe may be needed to withdraw small volumes of diluted drug from the larger syringe. This transfer can be accomplished easily with a 3-way stopcock. This allows for a greater precision in the delivery of a small volume. Even when a volume of greater than 1 mL is to be administered it might be advantageous to draw the volume up into a smaller syringe (e.g. a 2 mL or 3 mL syringe) to accurately administer volumes such as 1.2 mL or 1.8 mL.
8. This is the millilitre volume of the diluted solution to give via intravenous or intraosseous line. In general, give slowly to avoid adverse effects (except e.g. adenosine). This volume may be further diluted into the IV burette chamber (Buretrol/Volutrol/Soluset) to facilitate slow administration.

GUIDE TO USING THE EMERGENCY INFUSION TABLES

See Fig. 1.2:

- It is often necessary to commence infusions of vasoactive or other medications in the ED. The starting rates of commonly used infusions may be found in the same section as the bolus drug doses.
- To use the infusion starting dose panel, draw up the indicated amount of drug and dilute it with the specified amount of diluent into a 50 mL syringe.
- Some infusions require a bolus before commencing the infusion. Make sure that you are familiar with how each infusion should be initiated.
- A syringe-driver system is generally the most accurate and convenient system for administering infusions. If you are not using a syringe-driver system then the drug can be mixed into 200 mL of diluent and the infusion run at four times the indicated rate. Alternately, four times the amount of drug can be added to 200 mL and the infusion run at the same indicated rate.
- Begin the infusion at the starting rate as shown in the far right panel; this is usually the lowest effective dose and is always in mL/hr.

Emergency Infusions - starting rates			Initiate at	mL/hr
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min		0.1
1	2	3	4	5

Fig 1.2 A sample section of the infusion drug panel.

- If the desired clinical response is not achieved, then the rate of infusion may be increased as shown in the full infusion panel in [Chapter 6](#) of this book.
1. The generic drug name for the infusion.
 2. The suggested dilution of drug. The milligram dose of the drug to be infused, with the amount of diluent to be added is shown. Drugs in powder form may be required to be diluted with a special diluent or may be dissolved directly into normal saline, water for injection or 5% dextrose water. The use of a syringe-driver is recommended, therefore all volumes total 50 mL. Should an alternative infusion device be used, alternative doses and dilutions might be needed.
 3. Syringe size – this will be 50 mL for all infusions.
 4. The starting dosage or infusion rate of the infusion.
 5. Starting rate of infusion in mL/hr. This rate may be increased as needed according to the patient's response (see [Chapters 5 and 6](#)). Vigilant monitoring of the clinical response is essential.

GUIDE TO USING THE ANTIMICROBIAL DOSE TABLES

The experiences learnt from early goal directed therapy for sepsis have underlined the need for early appropriate antimicrobial therapy in the ED. For that reason these agents have been included in the 'urgent' category in this book. Obviously not every antimicrobial has been included, but enough of a variety is represented to allow you to pick drugs that are appropriate to the clinical scenario. All the doses are those that are recommended for 'serious infections' and are at the upper end of the dosing spectrum.

See [Fig. 1.3](#):

1. The generic drug name of the antimicrobial.
2. The recommended dose for serious infections is always expressed as 'per dose' rather than 'per day' to minimize chances of confusion.
3. The suggested frequency of administration of the antimicrobial. The dose that is presented might only apply to the loading dose or the first dose and you should ensure that you are familiar with the medication before prescribing or using it.
4. The suggested dilution of drug. The milligram dose of the drug to be infused, with the amount of diluent to be added is shown. Drugs in powder form may be required to be diluted with a special diluent or may be dissolved directly into normal saline, water for injection or 5% dextrose water.

Newborn / Small Infant					
Antimicrobial		Preparation - Dilute the drug to the final proportions indicated	3kg	4kg	5kg
Aciclovir 10mg/kg/dose tds		250mg/20mL (12.5mg/mL)	2	3	4
↑	↑	↑	↑	↑	↑
1	2	3	4	5	6

Fig 1.3 A sample section of the antibiotic bolus drug panel.

5. This is the final strength of the drug dilution. This value allows for easy cross-checking to ensure that correct doses are administered. It also allows for alternative dilutions with different preparations as long as the final dilution is the same.
6. The final volume to be administered. It should be administered in an appropriate fashion according to the agent (e.g. as a short infusion).

USING THE BROSELOW® TAPE AND THE PAWPER TAPE

How to use the Broselow® paediatric emergency tape

1. Place child supine on the stretcher.
2. Align the Broselow® tape alongside the child (Fig. 1.4).
3. Measure from the child's head to their heel – placing the side that has the arrow and says 'MEASURE FROM THIS END' at the child's head.
4. Take note of the weight and block colour reached at the patient's heel.

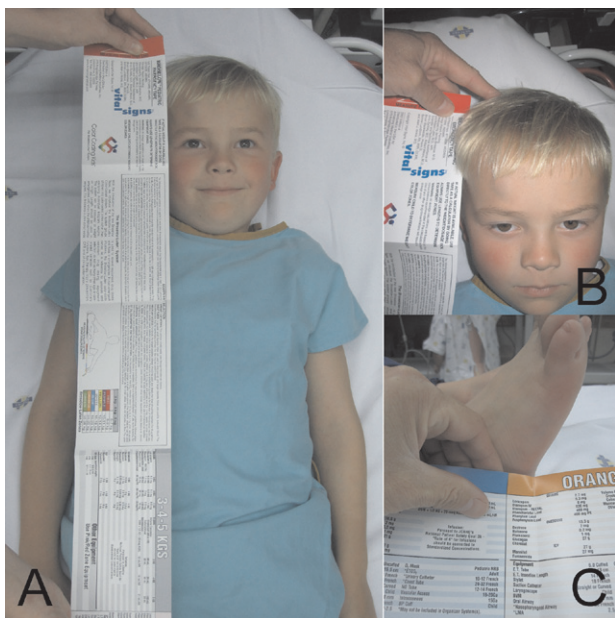


Fig 1.4 How to use the Broselow® tape. A – Lay the tape across the front of the supine child from head to heel. B – Use the fingers of the hand at the patient's head to feel for the vertex to align the end of the tape with the top of the head. C – Flex the foot to 90° and note where it crosses the tape. This might be easier with a second person in a large child.

5. Check for the drug required and the dosage thereof in the weight panel if available.
6. If the drug required is not available, use the weight measurement obtained and consult that weight page in the EDDC.

How to use the Paediatric Advanced Weight Prediction in the Emergency Room (PAWPER) tape

1. Place child supine on the stretcher.
2. Unroll tape alongside the child (Fig. 1.5).
3. Measure from the child's head to their heel – placing the side that has the five arrows and says 'MEASURE FROM THIS LINE' at the child's head.
4. Take note of the weight in the block obtained.
5. The main bold weight (Fig. 1.6) can be used if the child is of average build.

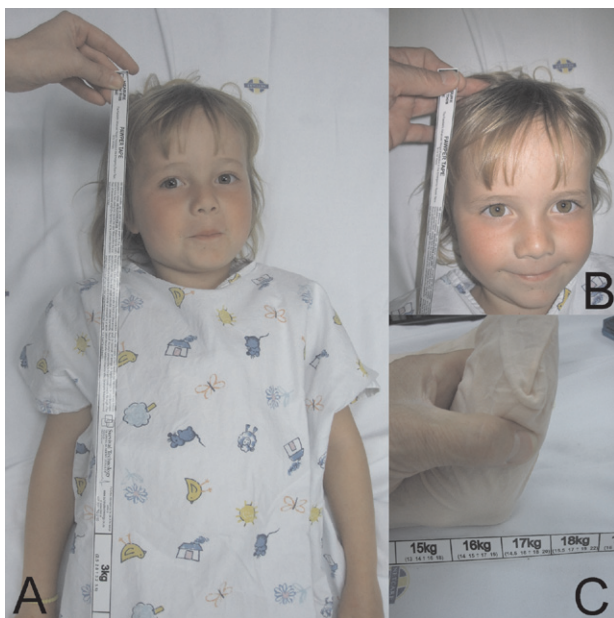


Fig 1.5 How to use the PAWPER tape. A – Unroll the tape across the front of the supine child from head to heel; the PAWPER tape is flexible and easy to align. B – Use the fingers of the hand at the patient's head to feel for the vertex to align the end of the tape with the top of the head. C – Flex the foot to 90° and note where it crosses the tape; it is essential to remove shoes and ideal to remove socks or stockings. This might be easier with a second person in a large child.

6. The other four weights are used if the child is not of average build in order to adjust for the child's body habitus. These weights correspond to the habitus score (HS) which is assigned during the tape measurement procedure (Fig. 1.7).
7. Check for the drug required and the dosage thereof in this book.
8. If the drug required is not available, use the weight measurement obtained in order to calculate the dosage.



Fig 1.6 A segment of the PAWPER tape showing the estimated weights for each of the habitus score categories – from left to right: skinny (HS1), slightly thin (HS2), average (HS3), slightly chubby (HS4), fat (HS5).

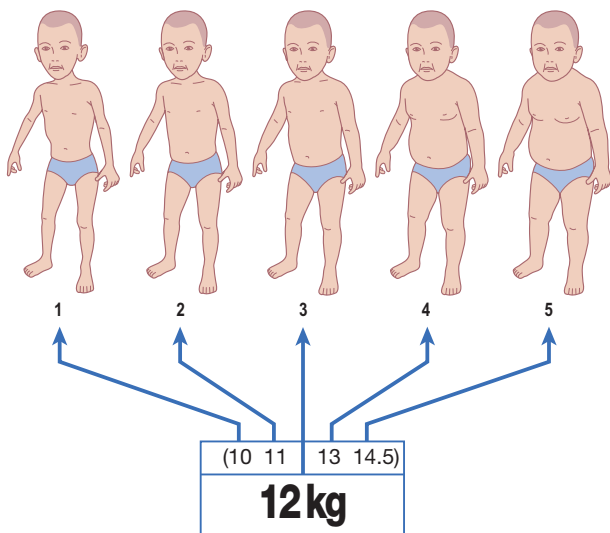


Fig 1.7 Differing weight-for-length in children. The use of five habitus scores with corresponding weights in each segment of the PAWPER tape allows for a more accurate weight estimation than that generated by other tape systems. A habitus score of 1 corresponds to a weight at the 5th centile of weight-for-length, a score of 2 with the 25th centile, a score of 3 (average) with the 50th centile, a score of 4 with the 75th centile and a score of 5 with the 95th centile. It is possible using a rapid 'eyeball' technique to accurately estimate deviation of body habitus from the average and to adjust the weight estimation accordingly.

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Overcoming medication errors in paediatric emergencies

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INTRODUCTION

One of the biggest hurdles to overcoming medication errors in children is that most healthcare providers are unaware of the magnitude of the problem. In most hospitals, the paediatric ward and ED generate the most medication errors. Accurate drug dose calculation and delivery in children can be challenging at the best of times, but in the stressful circumstances of a paediatric emergency or resuscitation it is even more difficult and susceptible to error. There is mounting evidence that mistakes in the process of medication prescription and administration are more common in adults than in children, and have a higher potential for harm than was previously realized. It is for this reason that it is useful for any doctor who is involved in the emergency management of children to have a knowledge of the nature of medication errors that occur in the ED, in order to develop a strategy to eliminate (or at least minimize) potential resultant harm to the patient. Merely encouraging ED staff (doctors and nurses) to be attentive to detail when dealing with medications is often fruitless, and disciplinary action against those making errors, when detected, is counter-productive. It requires a system designed to reduce medication-related harm to create a 'culture of safety' for paediatric patients in the ED.

POTENTIAL SOURCES OF MEDICATION ERRORS

Doctors and nursing staff members who are not experienced in paediatric emergency medicine or the management of paediatric emergencies are especially at risk of making medication-related errors (see [Table 2.1](#) for a breakdown of the types of errors that may lead to incorrect administration of a medication). Studies have shown that 10% to 15% of paediatric medication orders are erroneous, and that nearly one third of medication errors lead to harm in children. The potential for harm is higher in smaller children and infants and in the critically ill or injured, possibly because of the administration of multiple medications, limited time to double-check doses and altered pharmacokinetics and pharmacodynamics resulting from the physiological insults.

Case Study *A 5-year-old boy with severe haemophilia was knocked off his bicycle by a car. He is brought into the ED by ambulance with a Glasgow Coma Scale score of 7 out of 15, a systolic blood pressure of 70 mmHg, a heart rate of 160 beats per minute and a fractured right femur.*

While it might seem simple to 'give etomidate' as part of a rapid sequence intubation for initial airway management in this scenario, the potentials

Table 2.1 Types of error that may be incurred in the administration of medications

Type of error	Nature of error
Knowledge errors	<ul style="list-style-type: none"> • Incorrect drug, dose or route of administration used.
Performance or procedural errors	<ul style="list-style-type: none"> • Body weight not measured accurately. • Inaccurate prediction method employed. • Incorrect dose calculation – arithmetical errors. • Incorrect dose dilution – wrong mass or volume of drug or diluent. • Incorrect calculation of volume of dilution to administer. • Incorrect volume administration. • Omission of necessary drug administration. • Administration of a known allergen.
Communication errors	<ul style="list-style-type: none"> • Incorrect dose prescription, transcription or inaccurate communication.
Unavoidable errors	<ul style="list-style-type: none"> • Incorrect weight type used for dose calculation – total body weight/lean body weight/ideal body weight (this has not yet been established in children). • Inherent variability of drug content in manufacturer's packaging (ampoule or vial). This is normally required to be within 10 to 15% of the stated mass of drug. For example, an ampoule of adrenaline 1 mg may contain anything between 0.9 mg and 1.15 mg of adrenaline. This consequently may lead to up to a 15% error in drug dose delivery. • Complications related to drug preservatives, vehicles or diluents: the paucity of IV drug preparations designed for children has many unfortunate complications.

for error standing between this child and the optimum administration of medications (and other interventions) that might prove life-saving are immense. An emergency physician confronted by this case must:

1. First obtain the correct milligram per kilogram dose either from memory (which may be very unreliable) or from appropriate reference material, and then determine if any age or physiology-related adjustments need to be made. Drug dose recommendations in children are generally based on body weight (or occasionally body surface area) and therefore appropriate drug administration requires an accurate measured or estimated body weight and a dose calculation, dilution and delivery

that are free of errors. Not surprisingly, the most common medication errors in children in the ED are dosing errors, which can originate at any stage of the process – calculation, prescription, preparation or administration.

2. This base dose then needs to be converted to an actual total dose calculated from the patient's body weight. Ideally, body weight should be measured for drug dose calculations. In practice it is often impossible to measure weight in children who are critically ill or injured and undergoing resuscitative treatment. Estimates of the patient's weight by healthcare workers are notoriously inaccurate, but estimates of the child's weight by the parents are often very accurate, and acceptable to be used in an emergency situation. Alternative methods, if parents do not accompany the child, include length-based prediction methods such as the PAWPER tape, the derived weight estimation method or the Broselow® tape. The prediction of weight in the ED, and the determination of which form of weight to use for drug calculations (lean body weight, ideal body weight, adjusted body weight or total body weight) has been dealt with elsewhere in this book.
3. Once the weight has been determined, the total dose to be administered needs to be calculated. This simple arithmetic exercise has been shown to be very poorly performed even by experienced doctors, and order of magnitude (tenfold) errors in drug doses calculations are common in children.
4. This dose, once calculated, must be communicated to the staff member who will prepare the drug for administration. This most commonly occurs via a verbal instruction or a handwritten prescription. Misunderstandings are frequent following verbal instructions. Illegible handwriting, incorrect positioning of the decimal point, transcription errors and mental lapses (such as using milligrams instead of micrograms inappropriately) are common causes of errors. Computerized systems are not immune from error either.
5. Once the drug order has been given, the drug must be correctly prepared, diluted and administered by the nurse or doctor. This process also requires the calculation of the millilitre volume of drug dilution to administer and is susceptible to error, especially in inexperienced hands. The wrong amount of drug, the wrong type or volume of diluent and the wrong volume administered to the patient are additional causes of errors.

Each of these steps must be correctly completed to ensure that no medication error occurs. Furthermore, this process must be repeated for additional necessary medications such as suxamethonium, vecuronium, midazolam, fentanyl, resuscitative fluid boluses, concentrated factor IX and blood products, each time avoiding the pitfall of potential errors.

In order to provide optimum medical care these processes must be swiftly and successfully completed at the same time as managing the intellectual and emotional stress of a difficult paediatric resuscitation. Wrong drugs, wrong doses, wrong administration, as well as delays in treatment caused by ponderous calculations may negatively impact management. Ignorance of drug doses or the fear of errors may lead to the omission of necessary medications. Critical thinking time may well be wasted on the calculation of drug dosages and the determination of equipment sizes rather than focused on the medical management of the patient.

SOLUTIONS AND INTERVENTIONS TO REDUCE MEDICATION ERRORS

The vast majority of work done in the field of paediatric medication errors up until now has been on the identification of the nature and mechanics of errors. Work on finding solutions is just starting to appear.

Any error-reduction system should focus on two important aspects:

- A reduction in preventable adverse events related to medications.
- A holistic approach to eliminating any potential sources of error that may occur during medication administration, rather than a system that focuses on the doctor. The system should assist the doctor, the nurse and the pharmacist from the process of prescription to the administration of the drug to the patient.

The clearest message that has appeared in the literature has been that a culture of 'patient safety' or 'zero tolerance' of paediatric medication errors should be adopted. This includes the following aspects of emergency care planning and practice:

- Errors that do occur should be regarded as 'system errors' and not 'personal errors'. This empowers individuals to report errors that do occur and allows the system to be improved. An appropriate (efficient and impartial) medication error reporting and analysis process should be established to produce information which can be used to improve the system.
- The availability of paediatric formularies and paediatric-specific reference materials in the ED, including internet access, is strongly recommended.
- Involve a pharmacist as part of the resuscitation team, if possible, to assist with the emergency medication administration process.
- The approach to the resuscitation of the paediatric patient should be pre-planned and standardized, both in the general emergency medicine management and the specific medication administration system. The entire process should be kept as simple as possible. The drug administration process in emergencies must be designed with a reduced reliance on calculations, both by the doctor and the nurse.
- Part of the approach to paediatric resuscitation should include an emphasis on teamwork with open communication. Many medication errors are intercepted before reaching the patient as a result of effective teamwork. Good communication has been identified as having an important role in reducing medication errors. Resuscitation aids should be available for all members of the team.
- Reduce the cognitive load during paediatric emergencies. Resuscitation aids have been shown to reduce patient harm through decreasing critical-thinking time spent on drug dose calculations and increasing critical-thinking time used for patient management. The ideal resuscitation aid is *complete* (it provides information on the patient's weight, appropriate equipment sizes and complete drug dose information from dose to dilution to volume of administration (see below)), it is *easy to use* and is *resilient* (it can perform well under suboptimal conditions). The Broselow® tape on its own does not fulfil these conditions, but must be used with additional drug dose reference material.
- Ensure that doctors involved in the emergency care of children are appropriately trained in paediatric emergency medicine, receive continual proficiency training in resuscitation and are familiar with the use

of the available resuscitation aids. Similarly, nurses should also have appropriate education and ongoing training.

Since the most common errors that have been identified in emergency drug dosing in children have been related to incorrect doses, it is in this area that the system most needs to be changed.

- Computerized physician order entry systems, computer-based dose reference programs or web-based systems should be used if available. These have been introduced in the United States and have been shown to reduce drug dosing errors in the resuscitation situation. They are expensive, however, and many hospitals throughout the world will never have access to these systems. If present, technology should be used judiciously as it is not error-free, and alternatives should be available in the event of technology or power failure.
- Paper-based charts and tables (pre-printed medication order forms or ideally pre-printed forms containing complete drug dose information) have also been shown to improve the accuracy of medication prescription and delivery in children. These materials should be able to provide the team with the drug dose, the required dilution, and the volume of drug-dilution to administer, without any calculation or arithmetic required. Reference materials should also be 'bed-based' and not 'provider-based'. They should be available to all members of the resuscitation team and not just a single individual. This will decrease the risk for errors for both doctor and nurse, and facilitate cross-checking and double-checking of doses and volumes. Pre-printed weight-specific charts have the further benefit of accommodating additional information such as age-specific changes in dose recommendations (e.g. suxamethonium: 3 mg/kg in infants, 2 mg/kg in children, 1.5 mg/kg in adults).
- Part of the standardized approach to the resuscitation of children must include references for a number of methods of estimating body weight, including a length-based weight estimation method (e.g. the PAWPER tape or Broselow® tape). Age-based formulas are useful when tapes are unavailable, but are not as accurate as the length-based systems. Body weight should be obtained early and this weight used for further calculations.
- Avoid verbal prescriptions if possible as they are associated with a high error rate. Written prescriptions should be legible, avoid abbreviations, trailing zeros (5.0 milligrams) and 'naked decimal points' (.5 micrograms).

CONCLUSION

Medication errors are common and potentially harmful to children in the ED. The use of a drug dosing guide, such as this book, can eliminate many of the avoidable medication errors as well as lightening the intellectual load experienced in managing paediatric emergencies.

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Leadership, teamwork and resuscitation aids

3

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INTRODUCTION

Leadership competence is often overlooked as a core proficiency in clinical medicine. In emergency medicine, the ability to influence a team of personnel treating a critical patient is vital for a successful outcome. In the ED, since a team of rescuers is usually working simultaneously on a patient, this group must have a team leader to direct their efforts towards a common goal. Furthermore, a well-organized team of people can perform rapidly and achieve a great deal in a short time.

Too often this imperative is overlooked and mayhem is the order of the day, with too many people calling the shots with no apparent direction, or no-one willing to take the lead, resulting in a laissez-faire cop out. The patient bears the ultimate brunt of this failure to lead a team of individuals toward the common goal of effective and efficient resuscitation.

The good news is that leadership in this context is a skill that can be learnt and improved upon. For example, it has been shown that even one person trained as an ALS team leader can impact survival positively. Here are a few pointers to assist you:

POINTERS FOR EFFECTIVE TEAM LEADING

1. A leader must firstly be identified – either a willing volunteer or a pre-appointed senior clinician could assume this role. If possible, pre-allocation of roles, especially the team leader role, can avoid delay and consternation when an actual resuscitation is encountered.
2. Confidence comes from practice and is vital for a resuscitation team leader. It comes from knowing the resuscitation guidelines (or other protocols) well enough to apply them automatically. Do as much clinical work as you can under an experienced team leader whom you respect. Confidence also comes from good quality, practical, integrated, scenario-based training (see [Box 3.1](#)).
3. Self-confidence is also derived from knowing where to access the information you need during the management of an emergency. It is important to know where to get the information, the relevant algorithms and resuscitation aids, as well as how they work. Do not be pressured into trying to recall information, dosages and causes. It will be far more accurate and consistent to refer to resuscitation aids (see [Box 3.2](#)).
4. The leader should delegate functions to each team member in accordance with their expertise, experience and abilities. This can either be done immediately as the team forms around the patient or at the beginning of the shift in an ED.

Box 3.1 Simulation training for paediatric emergencies

Simulation training is an essential component of preparing and honing skills for paediatric emergencies, both for the individual and the team that will be involved. Simulation is particularly useful for high-risk events (such as invasive procedures) or critical low-frequency events (such as cardiac arrest resuscitation). Medical simulation training is aimed at imitating real patients, patient anatomy and clinical tasks which may be required in a real-life situation. It is intended to not only limit the risks associated with practising procedures on real patients but to offer the advantage of 'anytime practice' as opposed to waiting for a patient. This helps to reduce errors and improve patient safety. The features that simulation offers which make it educationally sound are:

- Allows the chance for hands-on practice.
- Allows for repetition.
- Enables the trainer to provide immediate feedback as well as debriefing.
- Allows for practice to be done in a team environment.
- Errors are valued – they raise an awareness of where performance can be improved upon without the fear of poor outcomes or reprisal.

Although many of the advanced life support courses offer simulation-based training, the evidence shows that there is poor long-term skill and knowledge retention. This is likely due to the amount of time between initial and refresher courses. For simulation training to be more effective, practice with mock scenarios should be occurring on a weekly basis.

There is also evidence to support the use of 'high-fidelity' (anatomically correct manikins) over 'low-fidelity' simulators and simulations. The feedback from 'high-fidelity' simulators helps to better provide the real-life feel to the scenario and is more important for first-time training and for junior personnel. The maintenance of skills and proficiency in teamwork can be done on low-fidelity simulators (such as a simple CPR manikin) on a weekly basis.

Although most of the evidence deals with teamwork in cardiac arrest scenarios, there are simulators for many aspects of paediatric emergency care. Any aspect of acute care that requires teamwork (such as rapid sequence intubation, trauma resuscitation or neonatal resuscitation) should be practised regularly, with role players endeavouring to immerse themselves completely in the scenario. This will create an effective, confident team and will ultimately result in better patient care. Simulation has become an indispensable part of acute care and must be embraced by all healthcare providers who might be involved in the emergency management of children.

5. *Management by objectives* is an age-old leadership tool which can neatly be applied in the resuscitation setting. The objectives for the resuscitation or medical procedure (e.g. rapid sequence intubation), as well as how these will be achieved, must be clear to all concerned. These should be voiced during the actual resuscitation so that everyone involved knows what is intended, or which algorithm is being followed, or what is being prepared and anticipated.

Box 3.2 Resuscitation aids in paediatric emergency care

There is an increasing emphasis on the need to use supplementary resources during the resuscitation of children. The intellectual and emotional stress that doctors experience during the resuscitation or emergency management of children in the ED may negatively impact on their ability to provide optimum treatment – partly through delays in determining drug doses, fluid volumes and flow rates or equipment sizes. Although there is considerable uncertainty about the actual dosages of many drugs that are used in emergencies, some experts believe that ‘cognitive paralysis’ or ‘paralysis by indecision’ resulting in a delay to institute treatment may be a more significant risk of poor outcome than an error of dosage. The use of resuscitation aids should be considered mandatory in the emergency management of children: they reduce delays in medication delivery; they reduce dosing errors; and they increase the confidence of the treating team in their management. The choice of a weight-estimation system should also include a consideration of how that system functions as a resuscitation aid, or as part of a resuscitation aid. The ideal resuscitation aid, in whatever form it takes, should provide the following comprehensive paediatric resuscitation assistance.

It should:

- Assist in changing non-automatic thinking and decisions, with respect to drug dosage and equipment sizing, into automatic* processes so that critical thinking can be uninterrupted and dedicated to medical management.
- Eliminate the need for any calculations.
- Provide an accurate estimate of weight based primarily on length.
- Provide accurate guidance on resuscitation equipment.
- Provide accurate information on fluid therapy, bolus drug dosages, drug dilution and volumes to deliver.
- Provide accurate information on the preparation and delivery of drug infusions.
- Provide accurate information on initial ED ventilator settings.
- Provide useful age-linked reminders with regard to drug dosing, e.g. the need for relatively higher doses of suxamethonium in infants.

Continued

Box 3.2 Continued

- Provide relevant information to every member of the team, e.g. not just a milligram drug dose for the doctor to order, but also instructions for the nurse on how to prepare and dilute the drug.

Resuscitation aids are about critical information, about thinking processes and about teamwork. They should be used during simulated and actual patient management until all healthcare providers are proficient with them. There is little doubt that to use resuscitation aids is to improve the quality of emergency care delivered to those patients most vulnerable to errors and indecision.

*This change is the foundation of resuscitation aids and is best explained by this analogy: when you start driving a car you have to think about everything – which pedals to push, which levers to pull, how to do every little thing. After a few years everything is done completely without thought, automatically and reflexively. Reading an instruction is automatic. Performing memory tasks and calculations is not. Thinking time needs to be spent where it is most needed – on patient management rather than trivial but essential distractors.

6. *Managing by measurement* is another leadership strategy which, when translated into ED practice, dictates that the ultimate goal beyond a single resuscitation is to improve performance by learning from experiences, mistakes and successes. The only way to improve quality is to measure everything that is being done, so that this can be assessed and reflected upon to identify gaps, errors, and areas for improvement. The time taken to perform interventions, the sequence of events, all results, drug and defibrillator energy dosages should be recorded to help the team leader keep track of progress, and to document a detailed synopsis of the resuscitation for the clinical records. This is vital for meaningful review and research purposes.
7. In terms of feedback, remember to give the positive first, then the 'negative', followed by another positive once again. It is imperative that the team leader is an encouraging person, who is able to positively reinforce behaviour on the one hand while also easily able to correct poor performance in a constructive manner on the other. The effective team leader must embrace the role of mentor and coach, and engage in teaching during the resuscitation. All too often the team leader shouts and manages the process aggressively, being critical, insulting and humiliating. This is unprofessional and unnecessary, and is rather a reflection of the lack of competence and confidence of the team leader. Unless the team leader inspires and cheers the team on, teaches in a constructive way, and organizes the resuscitation in a quiet and controlled manner, they should not expect anybody to eagerly volunteer to participate in their resuscitations ever again!
8. To ensure effective teamwork, all team members need to feel safe enough to contribute meaningfully to the process. They must feel that there will be no retribution for offering input when they notice

Box 3.3 The teamwork imperative – team dynamics, the checklist story

One of the lessons of the WHO surgical checklist (which, when used, has been shown to reduce postoperative complications dramatically), is that facilitating communication within the operating room team has excellent results. It emboldens each team member to contribute to the management – a medical student may notice something that the consultant has missed but will not mention it unless the team dynamic has been correctly established. Many traditional medical approaches need to be abandoned in emergency medicine to ensure optimum treatment for the patient.

something awry, for asking a question, or for suggesting something that has been overlooked. It is only a mature and confident team leader who is able to receive advice or feedback from a more junior member of the team, especially when the team leader has made an error. Team leaders also make mistakes and are not infallible demigods (see Box 3.3)!

9. In the same way that 'commentary driving' is used in advanced driving courses, 'commentary resuscitation' can be practised in the ED. This is a technique that forces the team leader to concentrate and focus on what is happening at that instant, and then to verbalize and discuss it out loud. This is an excellent way to summarize and review the progress, including where the team is in the management process or on the algorithm, what has been done and what still needs to be initiated. It allows those listening to hear the thoughts and thought processes of the team leader, and so is a powerful teaching tool. It further helps to structure the thoughts of the team leader, and so take control of what sometimes appears to be a runaway process.
10. Ideally, the management or resuscitation of every critically ill or injured child should embody the principles of action-centred leadership: the team leader has to simultaneously be aware of the needs of the group, each individual in that group, and the common task at hand. In order to succeed at the task (which is of supreme importance) both the requirements of the group and the individuals must be addressed. Each individual should be encouraged, coached and assisted to perform their tasks where necessary. Their contribution to the group effort should be acknowledged and welcomed. The team dynamic must be established and maintained.

CONCLUSION

The essence of leadership is to influence others to do a better job together as a team than any one person would be able to do by themselves. By measurement and evaluation, gaps can be identified and changes implemented to ensure each successive resuscitation effort is improved upon. Leadership is the art of getting others to *want* to do what you need them to do! Enjoy the privilege.

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Practical pharmacology in paediatric emergencies

4

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Do not skip this chapter! It is not mind-numbing pharmacology and should offer some useful tips on drug dosing in paediatric emergency management. (Please refer to [Chapters 5 and 6](#) for drug dosing tables.)

INTRODUCTION

Pharmacologists acknowledge that it is important to strike a balance between science and practicality when it comes to the clinical determination of drug dosages in children. While we understand many of the changes in pharmacokinetics that are related to growing up and to differences in body composition (body water and fatness), it is extremely unclear how to translate these into meaningful information when standing in front of the patient. There is even less information about emergency drug dose determination in a patient whose physiology is deranged from critical illness or injury. Fortunately, many of these issues have less application to initial or stat doses than to repeat or subsequent doses and can, to some degree, be avoided in drugs that can be titrated to clinical effect. This chapter contains some useful information and guidelines on how to modify drug dosage based on age or body composition, to ensure that the desired efficacy is achieved and overdosage is avoided.

OVERVIEW

Pharmacology in children is difficult primarily because of the differences in *pharmacokinetics* (what the body does to the drug) of any given drug between neonates, infants, children and adults, whereas the *pharmacodynamics* (what the drug does to the body) of that same drug will remain much the same across all developmental stages. An approach to paediatric drug dosing ideally needs to be based on the physiological and body composition characteristics of the child and the pharmacokinetic and pharmacodynamic qualities of a particular drug. In the few drugs that have been tested in children, there can be a 3- to 6-fold increase in the variability of the pharmacokinetics of a single drug dose for paediatric patients when compared to adults. This difference between adults and children is likely to remain unclear because of the difficulty in performing dose escalation studies in the paediatric population. This necessitates the initial dose estimation in paediatrics to be obtained via extrapolation approaches. The validity of such an extrapolation hinges on the similarity of disease

progression and concentration-responses between adults and children for any particular pathological process. All of this leads to the off-label use of many drugs in the paediatric population group. About 75% of drugs used in paediatrics have never been studied in children.

PHARMACOKINETICS IN CRITICAL ILLNESS

Some general pharmacokinetic principles that are relevant to emergency drug administration in critically ill children:

- Hypoxaemia as well as poor perfusion leads to decreased or unpredictable drug absorption from the GIT. This, in addition to variable first pass metabolism, is one of the reasons that intravenous administration is favoured to ensure optimum bioavailability of the drug.
- Rectal absorption can vary because of hypoperfusion and depending on how high in the rectum the medication is administered – higher up means absorption into the portal system and a greater enterohepatic first pass metabolism with a resultant decreased bioavailability. Drugs administered low in the rectum are delivered systemically via the inferior and middle rectal veins, before passing through the liver.
- Hepatic and renal function may be impaired because of decreased cardiac output, leading to diminished clearance of drugs and prolonged duration of action.
- Significant oedema may change the volume of distribution of hydrophilic drugs.

PHARMACOKINETICS IN THE DEVELOPING HUMAN

An insight into the changes in pharmacokinetics of the developing child will give you an appreciation of how drug dosing can be tailored to these developmental periods. Simplistically, the age-related changes are:

- Changes in volume of distribution – neonates have a relatively higher proportion of body water, which reaches adult levels before 1 year of age.
- Changes in plasma protein levels – these reach adult levels in early infancy.
- Changes in drug metabolizing enzyme systems – Phase I and Phase II liver enzymes reach adult levels of function by about 2 years of age (with much variation between individual enzymes).
- Changes in renal function – glomerular filtration rate and drug excretion reach adult levels at about 1 year of age.

So then, how do we go about determining the correct dose to use in children at different developmental stages?

METHODS OF ESTIMATING DRUG DOSES IN CHILDREN

Various methods are used in order to estimate paediatric drug dosages, with each having its own advantages and disadvantages:

1. Age-based dosing regimens:

This method takes into account the differences in physiological development between neonates, infants, children and adolescents. Unfortunately, these differences are not absolute or specific to certain maturational stages of development and do not take into consideration

the developmental differences and varied body composition of different children of the same age (fat vs. thin children).

2. **Body weight-based dosing regimens:**

Although there is a correlation between age and body weight, this does not apply to pharmacokinetics. Children between 2 and 6 years of age can potentially get under-dosed if using a body-weight dosing regimen, as they have an increased clearance of a drug. Attempting to compensate for this increase in clearance by increasing the dosage of the drug may compromise older children who do not have the increased clearance and thus may be potentially overdosed. Therefore a one-size-fits-all approach should not be used for all children.

3. **Body surface area-based dosing regimens:**

This method works on the premise that the physiology of the child is constant when expressed per unit of body surface area. The difference between the dosages calculated for BSA and body weight is more significant for paediatric patients in the younger age range. Dosing by BSA is more accurate for younger children as, for instance, children aged 2 years may have a dosage calculated by BSA of 1.7 times that calculated by weight. Unfortunately, this method requires complex calculations and may result in overdosing for certain drugs in neonates and infants. It also requires measurement of weight and length, is time-consuming and prone to errors in an emergency setting.

4. **Allometric scaling:**

This method works on the supposition that drug clearance and volume of distribution are scaled according to a body weight-based formula. It has similar disadvantages to BSA measurements and is inaccurate for children younger than 8 years of age.

There is no evidence to suggest that one or other of these systems is more accurate when determining drug dosages for emergency care. The great majority of drug doses are currently based on body weight, which is also the least complex system, and this is how the doses are presented in this book. As with most issues in pharmacology, it is not quite that simple. There is vigorous debate about what form of weight measurement or calculation should be used for paediatric drug dose calculations.

Drug dose calculation based on body weight

In emergencies, drug dose calculation is always based on body weight. What form of body weight is best and what modification to drug dosing should we adopt in children with an unusually high or low weight-for-length: total body weight, lean body weight, ideal body weight or adjusted body weight?

Total body weight

This is the actual measured weight of the child. If the child is underweight, then the child's actual body weight should be used to calculate the drug dosage. In obese children, if the patient weighs more than 20% above ideal body weight, adjusted body weight is often used.

Ideal body weight

There are three main ways to determine ideal body weight in children – the McLaren method, the Moore method and the body mass index method. The results obtained are similar for children under the age of 8 years old, but vary widely for older children.

The McLaren method (1972)

This method is based on McLaren and Read's nomogram comparing weight and height in relation to a child's age. It is the most commonly used method to calculate IBW in children. It is accomplished by plotting the child's age and height, converting the height to the 50th percentile for age and then correlating it with the corresponding weight on the 50th percentile for weight on the chart.

The Moore method (1985)

This method was created to compensate for the fact that not all children will grow according to the 50th percentile. It thus compares the same percentile for height with its corresponding percentile for weight, i.e. if a child is on the 3rd percentile for height, the IBW would be obtained on the 3rd percentile for weight.

The body mass index method

IBW is calculated by using the predicted BMI for height at the 50th percentile

$$\text{IBW} = [\text{BMI at the 50th percentile for that child's age}] \times [\text{Height in m}^2].$$

Lean body weight

James' equation:

$$\text{LBW} = (1.10 \times \text{TBW}) - (0.0128 \times \text{BMI} \times \text{TBW}) \quad \text{males}$$

$$\text{LBW} = (1.07 \times \text{TBW}) - (0.0148 \times \text{BMI} \times \text{TBW}) \quad \text{females}$$

Adjusted body weight

$$\text{ABW} = \text{IBW} + [\text{factor} \times (\text{TBW} - \text{IBW})]$$

Adjusted body weight uses a factor to take the patient's excess weight into account. The distribution is usually presumed to be approximately 20–50% of the excess weight. Therefore the factor is usually 0.2–0.5 of the excess weight added to the IBW. In general, if in doubt, use 0.4 unless another factor is specifically recommended.

Obese children

A useful rule of thumb in obese children is that 75% of their excess weight is fat mass and the remainder lean mass. The lean mass also has an increased hydration which has been attributed to an expanded extracellular water space. This over-hydration increases the lean mass value, which also needs to be taken into account when calculating body composition. If the patient weighs more than 20% above IBW, use ABW.

Table 4.1 shows the theoretical recommended dosing strategies for the major drug classes according to type of body weight.

DOSE MODIFICATION FOR DEVELOPMENTAL STAGE, CRITICAL ILLNESS AND ABNORMAL BODY COMPOSITION

General principles

- When a drug can be titrated to effect then this will eliminate many of these problems. Slow administration of a drug will also minimize unwanted side effects, especially in haemodynamically compromised patients, and allow for minimum effective doses to be used.

Table 4.1 Theoretical recommended dosing strategies for the major drug classes according to type of body weight

Drug	Loading/stat dose	Maintenance dose	Tips and tricks
Amiodarone	ABW to TBW		Large Vd – may need repeat loading dose.
Benzodiazepines	TBW	IBW	Titrate to effect.
Corticosteroids	ABW	IBW	Low toxicity in overdose so slightly higher than expected doses will cause little harm.
Digoxin	IBW	IBW	Slow administration using a regime that will diminish toxic potential is important.
Fentanyl	TBW	$0.8 \times \text{IBW}$	Titrate to effect.
H ₂ blockers	IBW	LBW	
Ketamine	IBW	IBW	Titrate to effect. Easier to titrate IV rather than IM.
Lidocaine	ABW	IBW	Use TBW for the dose recommended in this book which is at the lower edge of the range.
Morphine	TBW	IBW	Titrate to effect.

Continued

Table 4.1 Continued

Drug	Loading/stat dose	Maintenance dose	Tips and tricks
Phenytoin	IBW or $[14 \times \text{IBW}]$ + $[19 \times (\text{TBW} - \text{IBW})]$	IBW	Use TBW for the dose recommended in this book which is at the lower edge of the range.
Procainamide	IBW	IBW	
Propofol	ABW to TBW*	ABW	Titrate to effect (*will affect haemodynamics more).
Rocuronium	IBW	IBW	Higher stat doses will have little negative consequence beyond prolonging the duration of action.
Succinylcholine	TBW	–	Important that enough drug is administered.
Thiopentone	IBW	IBW	Titrate to effect. Subsequent doses accumulate in adipose tissue.
Vecuronium	IBW	IBW	Higher stat doses will have little negative consequence beyond prolonging the duration of action.
Verapamil	TBW	ABW	This drug should be administered slowly; stop infusion if detrimental side effects develop.

Developmental stage

- Drug doses for neonates and infants may need to be relatively higher in mg/kg values than for older children – be prepared to repeat a dose or to administer slightly higher doses than expected. On the contrary, drugs are cleared more slowly and so have a longer duration of action. Repeated drug doses must be given at longer intervals and infusions administered at slower rates than for older children.
- Percutaneous absorption of medications is much higher in infants and neonates (and even more so in preterm neonates) than older children and adults. Toxicity from dermal application of medication is a real danger in this group.
- Rectal administration of drugs in neonates and infants is subject to variable absorption and metabolism and should be used with care.
- Children of 2 to 6 years of age appear to clear drugs more rapidly than other developmental ages. Higher doses and shorter dosing intervals or higher infusion rates may be required in this group.

Critical illness

- Critically ill children often have renal dysfunction. The doses of drugs that are excreted via the kidneys should therefore be reduced for subsequent doses.
- Hepatic dysfunction should also be taken into account. Enzymes for Phase I and II reactions will be hindered in their functioning, leading to a decreased metabolism of certain drugs as well as decreased perfusion of the liver, which again affects subsequent doses rather than the initial one.
- Acidosis impedes the body's ability to respond to catecholamines. Higher doses of these vasoactive drugs may be required in this setting, or the acidosis may require aggressive treatment.

Obesity

- Hydrophilic drugs – dose according to IBW or ABW in the obese patient, e.g. phenytoin, rocuronium, adrenaline, sodium bicarbonate.
- Lipophilic drugs – dose according to TBW, e.g. amiodarone, benzodiazepines, carbamazepine.
- *Ventilator weight* – There is no evidence to support which is the appropriate weight to use in obese children who are being ventilated. By extrapolating from adult studies, the most rational approach to ventilation in children would be to calculate tidal volume at 6 mL/kg using IBW or tape predicted weight based on length.

So what is the bottom line about drug dose modification in emergencies under these special circumstances?

1. Fortunately, there is little need to modify drug dosages for stat administration. Always use TBW for an initial drug dose if there is any doubt, and administer it slowly while observing for the desired clinical effect. Don't let thoughts about dose modification impair your ability to manage the patient in an emergency – the *paralysis by indecision* of cognitive overload.
2. Use a tape-based weight prediction rather than any other form of weight estimation – it will probably offer the best indication of correct dosing. A system like the PAWPER tape will offer the best weight estimation

and the least chance of under- or overdosing both in children with a higher and a lower than average weight-for-length.

3. Use a PAWPER tape-based weight estimation (with a habitus score of 5) for obese children – this will offer a weight close to an ABW and will pose little danger of overdosing.
4. Before subsequent doses are due in the ED or ICU there will be time to obtain a measured TBW, calculate IBW and plan the strategy for further dosing.

Emergency bolus drug dosing charts

5

This section contains the main resuscitation aid data that are vital to assist you to optimize paediatric emergency care. The book can be used to prevent the need for drug dose calculations and contains an 'all-in-one' reference guide for point-of-care management.

The weight categories in this book have been selected from a pragmatic perspective to ensure that drug dosages are accurate in the group of children most at risk for drug dosing errors (those under 10 kg) and that a logical progression of dosing volumes occurs at the heavier end of the range. The colour zones of the Broselow®–Luten system have been included so that if the Broselow® tape is used to estimate weight then it is easy to find the drug dose calculations of the weight groups falling into that colour zone:

Broselow® colour-band	Child weights	See Charts
Grey	2 kg, 2.5 kg, 3 kg, 4 kg, 5 kg	Charts 5.1–5.24
Pink	6 kg, 7 kg	Charts 5.25–5.34
Red	8 kg, 9 kg	Charts 5.35–5.44
Purple	10 kg, 11 kg	Charts 5.45–5.54
Yellow	12 kg, 14 kg	Charts 5.55–5.64
White	16 kg, 18 kg	Charts 5.65–5.74
Blue	20 kg, 22 kg	Charts 5.75–5.84
Orange	24 kg, 28 kg	Charts 5.85–5.94
Green	32 kg, 36 kg	Charts 5.95–5.104
Black	42 kg, 48 kg	Charts 5.105–5.114

The following information can be found in each section of this chapter:

- A guide to resuscitation equipment sizing for each weight category.
- A table of normal vital signs for each weight category.
- A guide to the initial ventilator settings to be used for each weight category.
- A table of initial antibiotic doses in alphabetical order for each weight. These drugs are included because of the importance of early antibiotic therapy (as part of early goal directed therapy for sepsis *inter alia*) being initiated in the ED.
- Drug dosing guidelines for bolus drug administration in alphabetical order for each weight, including suggested dose, dilution and volume to administer, plus the syringe size(s) to use.
- Emergency infusion starting rates of some of the commonly needed medications. The full infusion Charts can be found in Chapter 6.

5 Emergency bolus drug dosing charts

NOTE: Although most drugs have been presented for every weight category, these drugs might not be registered by their manufacturers for this weight or age-group, or their use may be controversial. You are advised to make your own decision about what drugs are or are not appropriate to use for each patient.

Small Neonate		2kg 2.5kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	0	Average BP (mmHg)	72/55
ETT size cuffed	-	Maximum SBP (mmHg)	100
ETT size uncuffed	2.5 to 3.0mm	Minimum SBP (mmHg)	60
ETT depth	7.5 to 9cm	Heart rate (per min)	127 (98,156)
Introducer	6 Fr (2mm)	Respiratory rate (per min)	43 (30, 62)
Bougie	5 Fr (1.7mm)	Urine output (mL/hour)	4 to 5
Oropharyngeal airway	50mm / Size 0	Peak expiratory flow (L/min)	-
Nasopharyngeal airway	4 x 60mm	Body surface area (m ²)	0.2
Bag-valve resuscitator	Neonate / Infant	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Round 0		
Suction catheter	6 Fr		
Heat-moisture exchanger	± 2.5mL		
Intercostal drain size	8 Fr	F _{O₂}	100%
Urethral catheter	5 Fr (1.7mm)	Respiratory rate (per min)	50
Intraosseous needle size	18G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	5mm	I:E ratio	1:2
Nasogastric tube size	5 Fr (1.7mm)	Inspiratory time (s)	0.4 (33%)
IV access	24G	PS / ASB (cmH ₂ O)	10
BP cuff	Newborn	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 1	Trigger (L/min or cmH ₂ O)	0.2 or -2
Laryngeal tube airway	Size 0	Peak flow (L/min)	>5
CVC size	4 Fr	Ramp waveform	Decelerating
CVC depth	50mm	Volume Control	2kg 2.5kg
Airtraq™	Size 0 (Grey)	Tidal volume (mL)	12 15
		Minute volume (L)	0.6 0.75
		Pressure Control	2kg 2.5kg
		PIP (cmH ₂ O)	20

Chart 5.1

Small Neonate			
Antimicrobials	Preparation - Dilute the drug to the final proportions indicated	2kg	2.5kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	1.6	2
Amikacin 25mg/kg loading dose	100mg/10mL (10mg/mL)	5	6.2
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	1.2	1.5
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	1.1	1.3
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute with at least 20-fold volume of D5W	0.5	0.6
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	0.5	0.6
Azithromycin 10mg/kg/dose od	500mg/ 50mL (10mg/mL)	2	2.5
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	1.6	2
Cefepime 50mg/kg/dose bd	500mg/10mL (50mg/mL)	2	2.5
Ceftriaxone 100mg/kg/dose bd	500mg/10mL (50mg/mL)	4	5
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	2.1	2.7
Ciprofloxacin 10mg/kg/dose tds	100mg/50mL (2mg/mL)	10	12
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	2	2.5
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	2	2.5
Cotrimoxazole 0.2mL/kg/dose qid	80mg/400mg in 5mL (16mg/80mg/mL)	0.4	0.5
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	1	1.3
Fluconazole 6mg/kg/dose od	undiluted (2mg/mL)	6	7.5
Gentamicin 8mg/kg loading dose	80mg/20mL (4mg/mL)	4	5
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	4	5
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	10	12
Meropenem 40mg/kg/dose tds	500mg/10mL (50mg/mL)	1.6	2
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	3	3.8
Penicillin G 100kU/kg/dose qid	1MU/10mL (100kU/mL)	2	2.5
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	2.5	3
Quinine 20mg/kg/dose loading dose	300mg/50mL D5W (6mg/mL)	6.5	8
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	2	2.5
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	4	5

Chart 5.2

2kg	2kg	2kg	2kg	2kg	2kg	2kg
Medication		Syringe (mL)		Preparation		mL
Adenosine 1 st dose 0.1mg/kg		1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.2
Adenosine next doses 0.2mg/kg		1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.4
Adrenaline IM		1	10	1:1000 solution (1mg/mL) undiluted		0.1
Adrenaline IV/IO 0.01mg/kg		1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.2
Amiodarone 5mg/kg		1	10	150mg/3mL + 7mL dil. (15mg/mL)		0.7
Atropine 0.02mg/kg		5	10	0.5mg/1mL + 4mL dil. (0.1mg/mL)		1
Atropine for OP poisoning 0.05mg/kg		5	10	0.5mg/1mL + 4mL dil. (1mg/mL)		1
Biperiden 0.1mg/kg		1	10	5mg/1mL + 9mL dil. (0.5mg/mL)		0.4
Blood bolus 10mL/kg		Adjust dose to indication; warm before use				20
Blood packed cells transfusion			mL to ↑ Hb by 1g/dL			12
Calcium chloride 20mg/kg		1	10	1g/10mL undiluted (100mg/mL)		0.4
Calcium gluconate 60mg/kg		10	10	1g/10mL undiluted (100mg/mL)		1.2
Chlorpheniramine 0.1mg/kg		1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.2
Clonazepam 0.02mg/kg		1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.4
Cryoprecipitate 3mL/kg		Adjust dose to indication; warm before use				6
Cardioversion 1J/kg		Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				2
Defibrillation 4J/kg						8
Dantrolene 1mg/kg		60	10	20mg in 60mL dil.(0.33mg/mL)		6
Desmopressin 0.3µg/kg		10	10	4µg/1mL + 9mL dil. (0.4µg/mL)		1.5
Dexamethasone 0.6mg/kg		1	5	4mg/2mL undiluted (2mg/mL)		0.6
Diazepam IV/IO 0.2mg/kg		1	10	10mg/2mL undiluted (5mg/mL)		0.1
Diazepam PR 0.5mg/kg		1	10	10mg/2mL undiluted (5mg/mL)		0.2
Digoxin 15µg/kg first dose		10	10	0.25mg/1mL + 9mL dil. (25µg/mL)		1.2
Diphenhydramine 1mg/kg		1	10	50mg/1mL + 9mL dil. (5mg/mL)		0.4
Ephedrine 0.3mg/kg		1	20	50mg/1mL + 19mL dil. (2.5mg/mL)		0.2
Etomidate 0.3mg/kg		1	20	20mg/10mL + 10mL dil. (1mg/mL)		0.6
Factor VIII concentrate		300IU/10mL give slowly IV			3	
Factor IX concentrate		500IU/10mL give slowly IV			3	

Chart 5.3

2kg	2kg	2kg	2kg	2kg	2kg	2kg
Medication	Syringe (mL)		Preparation		mL	
Fentanyl 1µg/kg	1	10	100µg/2mL + 8mL dil. (10µg/mL)		0.2	
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use				40	
Flumazenil 0.01mg/kg	1	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		0.4	
Fosphenytoin 20mg/kg	20		500mg/10mL + 10mL dil. (25mg/mL)		1.6	
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use				30	
Furosemide 0.5mg/kg	1	10	20mg/2mL + 8mL dil. (2mg/mL)		0.5	
Glucagon 0.05mg/kg	10		1mg/1mL + 9mL dil. (0.1mg/mL)		1	
Glucose (D25W) 0.5g/kg	20		10mL D50W + 10mL dil. (0.25g/mL)		4	
Glycopyrrolate 0.01mg/kg	10		0.2mg/1mL + 9mL dil. (0.02mg/mL)		1	
Hydrocortisone 4mg/kg	1	10	100mg/2mL + 8mL dil. (10mg/mL)		0.8	
Insulin (soluble) 0.1U/kg	1		10U/0.1mL + 0.9mL dil. (10U/mL)		0.2	
Ketamine IV/IO 2mg/kg	1		10mg/mL undiluted		0.4	
Ketamine IM 4mg/kg	1	5	10mg/mL undiluted		0.8	
Ketofol 0.75mg/kg ketamine and propofol	1		mL of propofol 1% + ketamine 1%		0.2	
Ketorolac 0.5mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		-	
Labetalol 0.2mg/kg	1		5mg/mL undiluted		0.1	
Lidocaine 1mg/kg	1	10	100mg/5mL + 5mL dil. (10mg/mL)		0.2	
Lorazepam 0.1mg/kg	1	10	4mg/1mL + 7mL dil. (0.5mg/mL)		0.4	
Magnesium sulphate 40mg/kg	1	10	1g/2mL + 8mL dil. (100mg/mL)		0.8	
Maintenance fluids mL/hr					8	
Mannitol 1g/kg	20		25g/100mL undiluted (0.25g/mL)		8	
Methylene blue 1mg/kg	1	10	100mg/10mL undiluted (10mg/mL)		0.2	
Methylprednisolone 2mg/kg	10		40mg/1mL + 9mL dil. (4mg/mL)		1	
Midazolam IV/IO 0.1mg/kg	1	5	5mg/5mL undiluted (1mg/mL)		0.2	
Midazolam IM 0.2mg/kg	1		5mg/5mL undiluted (1mg/mL)		0.4	
Morphine 0.05mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.1	
N-acetylcysteine IV 150mg/kg	10		2g/10mL + 10mL dil. (100mg/mL)		3	
N-acetylcysteine PO 140mg/kg			400mg sachets		1	

Chart 5.4

2kg	2kg	2kg	2kg	2kg	2kg	2kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	1	0.4mg/mL undiluted	0.5			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	1.6			
Obidoxime 4mg/kg	1 20	250mg/1mL + 19mL dil. (12.5mg/mL)	0.6			
Ondansetron 0.15mg/kg	1 10	4mg/2mL + 8mL dil. (0.4mg/mL)	0.8			
Pancuronium 0.1mg/kg	1 10	4mg/2mL + 8mL dil. (0.4mg/mL)	0.5			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	-			
Paracetamol 15mg/kg	10	10mg/mL undiluted	3			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	1			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	8			
Platelets 10mL/kg	Adjust dose to indication; warm before use			20		
Potassium IV/IO for severe hypokalaemia	1	KCl 15% (2mmol/mL) - give SLOWLY	0.7			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	1			
Procainamide 15mg/kg	1 10	1g/10mL undiluted (100mg/mL)	0.3			
Promethazine 0.5mg/kg	1 10	25mg/1mL + 9mL dil. (2.5mg/mL)	0.4			
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	0.6			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	1			
Ranitidine 1mg/kg	1 10	50mg/2mL + 8mL dil. (5mg/mL)	0.4			
Rehydration – mild dehydration		mL/hr for 24hours	12			
Rehydration – moderate dehydration		mL/hr for 24hours	18			
Rehydration – severe dehydration		mL/hr for 24hours	20			
Rocuronium 1mg/kg	1 10	50mg/5mL + 5mL dil. (5mg/mL)	0.4			
Salbutamol 15µg/kg	1 10	500µg/1mL + 9mL dil. (50µg/mL)	0.6			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	2			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	8			
Suxamethonium 3mg/kg	1 10	100mg/2mL + 8mL dil. (10mg/mL)	0.6			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	1			
Thiopentone 4mg/kg	1 20	500mg in 20mL dil. (25mg/mL)	0.3			
Tilidene 1mg/kg		drops of 2.5mg/drop solution	-			

Chart 5.5

2kg	2kg	2kg	2kg	2kg	2kg	2kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	1			
Toxic dose: lidocaine 1% + adrenaline			1.4			
Toxic dose: bupivacaine 0.5%			1			
Toxic dose: ropivacaine 0.75%			1			
Toxic dose: prilocaine 1%			1.5			
Tramadol 1.5mg/kg	1 20	100mg/2mL + 18mL dil. (5mg/mL)	0.6			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	1			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	2			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	0.6			
Vecuronium 0.1mg/kg	1 10	4mg into 10mL dil. (0.4mg/mL)	0.5			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	1			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	3			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.06			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	0.28			
Atropine 10mg/20mL + 30mL dil.	50	0.2mg/kg/hr	2			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	2			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.12			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.15			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	1			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.24			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.12			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.06			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.2			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	0.6			

Chart 5.6

2.5kg	2.5kg	2.5kg	2.5kg	2.5kg	2.5kg
Medication		Syringe (mL)		Preparation	mL
Adenosine 1 st dose 0.1mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.3
Adenosine next doses 0.2mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.5
Adrenaline IM		1	1:1000 solution (1mg/mL) undiluted		0.1
Adrenaline IV/IO 0.01mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.3
Amiodarone 5mg/kg	1	10	150mg/3mL + 7mL dil. (15mg/mL)		0.8
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		1
Atropine for OP poisoning 0.05mg/kg		5	0.5mg/1mL + 4mL dil. (1mg/mL)		1
Biperiden 0.1mg/kg	1	10	5mg/1mL + 9mL dil. (0.5mg/mL)		0.5
Blood bolus 10mL/kg		Adjust dose to indication; warm before use			25
Blood packed cells transfusion		mL to ↑ Hb by 1g/dL			15
Calcium chloride 20mg/kg	1	10	1g/10mL undiluted (100mg/mL)		0.5
Calcium gluconate 60mg/kg		10	1g/10mL undiluted (100mg/mL)		1.5
Chlorpheniramine 0.1mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.3
Clonazepam 0.02mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.5
Cryoprecipitate 3mL/kg		Adjust dose to indication; warm before use			7.5
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				3
Defibrillation 4J/kg					10
Dantrolene 1mg/kg		60	20mg in 60mL dil. (0.33mg/mL)		7.5
Desmopressin 0.3µg/kg		10	4µg/1mL + 9mL dil. (0.4µg/mL)		1.9
Dexamethasone 0.6mg/kg	1	5	4mg/2mL undiluted (2mg/mL)		0.8
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)		0.1
Diazepam PR 0.5mg/kg		1	10mg/2mL undiluted (5mg/mL)		0.2
Digoxin 15µg/kg first dose		10	0.25mg/1mL + 9mL dil. (25µg/mL)		1.5
Diphenhydramine 1mg/kg	1	10	50mg/1mL + 9mL dil. (5mg/mL)		0.5
Ephedrine 0.3mg/kg	1	20	50mg/1mL + 19mL dil. (2.5mg/mL)		0.3
Etomidate 0.3mg/kg	1	20	20mg/10mL + 10mL dil. (1mg/mL)		0.8
Factor VIII concentrate		300IU/10mL give slowly IV			4
Factor IX concentrate		500IU/10mL give slowly IV			4

Chart 5.7

2.5kg	2.5kg	2.5kg	2.5kg	2.5kg	2.5kg
Medication		Syringe (mL)		Preparation	mL
Fentanyl 1µg/kg	1	10	100µg/2mL + 8mL dil. (10µg/mL)		0.2
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use			50
Flumazenil 0.01mg/kg	1	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		0.5
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		2
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use			38
Furosemide 0.5mg/kg	1	10	20mg/2mL + 8mL dil. (2mg/mL)		0.6
Glucagon 0.05mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		1.3
Glucose (D25W) 0.5g/kg		20	10mL D50W + 10mL dil. (0.25g/mL)		5
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		1.3
Hydrocortisone 4mg/kg	1	10	100mg/2mL + 8mL dil. (10mg/mL)		1
Insulin (soluble) 0.1U/kg		1	10U/0.1mL + 0.9mL dil. (10U/mL)		0.2
Ketamine IV/IO 2mg/kg		1	10mg/mL undiluted		0.5
Ketamine IM 4mg/kg	1	5	10mg/mL undiluted		1
Ketofol 0.75mg/kg ketamine and propofol		1	mL of propofol 1% + ketamine 1%		0.2
Ketorolac 0.5mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		-
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.1
Lidocaine 1mg/kg	1	10	100mg/5mL + 5mL dil. (10mg/mL)		0.3
Lorazepam 0.1mg/kg	1	10	4mg/1mL + 7mL dil. (0.5mg/mL)		0.5
Magnesium sulphate 40mg/kg	1	10	1g/2mL + 8mL dil. (100mg/mL)		1
Maintenance fluids mL/hr					10
Mannitol 1g/kg		20	25g/100mL undiluted (0.25g/mL)		10
Methylene blue 1mg/kg	1	10	100mg/10mL undiluted (10mg/mL)		0.3
Methylprednisolone 2mg/kg		10	40mg/1mL + 9mL dil. (4mg/mL)		1.3
Midazolam IV/IO 0.1mg/kg	1	5	5mg/5mL undiluted (1mg/mL)		0.3
Midazolam IM 0.2mg/kg		1	5mg/5mL undiluted (1mg/mL)		0.5
Morphine 0.05mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.1
N-acetylcysteine IV 150mg/kg		10	2g/10mL + 10mL dil. (100mg/mL)		3.8
N-acetylcysteine PO 140mg/kg			400mg sachets		1

Chart 5.8

2.5kg	2.5kg	2.5kg	2.5kg	2.5kg	2.5kg
Medication		Syringe (mL)		Preparation	mL
Naloxone full dose 0.1mg/kg	1	0.4mg/mL undiluted			0.6
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)			2
Obidoxime 4mg/kg	1	20	250mg/1mL + 19mL dil. (12.5mg/mL)	0.8	
Ondansetron 0.15mg/kg	1	10	4mg/2mL + 8mL dil. (0.4mg/mL)	0.9	
Pancuronium 0.1mg/kg	1	10	4mg/2mL + 8mL dil. (0.4mg/mL)	0.6	
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)			-
Paracetamol 15mg/kg	10	10mg/mL undiluted			4
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)			1.3
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)			10
Platelets 10mL/kg	Adjust dose to indication; warm before use				25
Potassium IV/IO for severe hypokalaemia	1	KCl 15% (2mmol/mL) - give SLOWLY			0.9
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)			1.3
Procainamide 15mg/kg	1	10	1g/10mL undiluted (100mg/mL)	0.4	
Promethazine 0.5mg/kg	1	10	25mg/1mL + 9mL dil. (2.5mg/mL)	0.5	
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)			0.8
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)			1.3
Ranitidine 1mg/kg	1	10	50mg/2mL + 8mL dil. (5mg/mL)	0.5	
Rehydration – mild dehydration		mL/hr for 24hours			15
Rehydration – moderate dehydration		mL/hr for 24hours			22
Rehydration – severe dehydration		mL/hr for 24hours			25
Rocuronium 1mg/kg	1	10	50mg/5mL + 5mL dil. (5mg/mL)	0.5	
Salbutamol 15µg/kg	1	10	500µg/1mL + 9mL dil. (50µg/mL)	0.8	
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving			3
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L			10
Suxamethonium 3mg/kg	1	10	100mg/2mL + 8mL dil. (10mg/mL)	0.8	
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)			1.3
Thiopentone 4mg/kg	1	20	500mg in 20mL dil. (25mg/mL)	0.4	
Tilidine 1mg/kg		drops of 2.5mg/drop solution			1

Chart 5.9

2.5kg	2.5kg	2.5kg	2.5kg	2.5kg	2.5kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	1		
Toxic dose: lidocaine 1% + adrenaline			1.5		
Toxic dose: bupivacaine 0.5%			1		
Toxic dose: ropivacaine 0.75%			1		
Toxic dose: prilocaine 1%			2		
Tramadol 1.5mg/kg	1 20	100mg/2mL + 18mL dil. (5mg/mL)	0.8		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	1.3		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	2.5		
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	0.8		
Vecuronium 0.1mg/kg	1 10	4mg into 10mL dil. (0.4mg/mL)	0.6		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	1.3		
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	3.5		
Emergency Infusions - starting rates	Initiate at		mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.08		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	0.35		
Atropine 10mg/20mL + 30mL dil.	50	0.2mg/kg/hr	2.5		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	2.5		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.15		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.19		
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	1.3		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.3		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.15		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.08		
Propofol 1% solution undiluted	50	1mg/kg/hr	0.3		
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	0.8		

Chart 5.10

Newborn / Small Infant		3kg	4kg	5kg	
Resuscitation Equipment		Normal Vital Signs			
Laryngoscope blade	0 to 1	Average BP (mmHg)		90/52	
ETT size cuffed	-	Maximum SBP (mmHg)		110	
ETT size uncuffed	3.0 to 3.5mm	Minimum SBP (mmHg)		70	
ETT depth	10 to 10.5cm	Heart rate (per min)		140 (112, 167)	
Introducer	6 Fr (2mm)	Respiratory rate (per min)		41 (29, 60)	
Bougie	5 Fr (1.7mm)	Urine output (mL/hour)		6 to 10	
Oropharyngeal airway	50mm / Size 0	Peak expiratory flow (L/min)		-	
Nasopharyngeal airway	4 x 60mm	Body surface area (m ²)		0.25	
Bag–valve resuscitator	Infant / Child	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O			
Mask	Round 0 to 1				
Suction catheter	6 to 8 Fr				
Heat–moisture exchanger	± 2.5mL				
Intercostal drain size	10 to 12 Fr	F _I O ₂	100%		
Urethral catheter	5 Fr	Respiratory rate (per min)	50		
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5		
Intraosseous needle depth	5 to 7mm	I:E ratio	1:2		
Nasogastric tube size	5 to 8 Fr	Inspiratory time (s)	0.4 (33%)		
IV access	22 to 24G	PS / ASB (cmH ₂ O)	10		
BP cuff	Newborn	Inspiratory pause / T _{plat} (s)	0		
Laryngeal mask airway	Size 1	Trigger (L/min or cmH ₂ O)	0.3 or -2		
Laryngeal tube airway	Size 0	Peak flow (L/min)	>5		
CVC size	4 to 5 Fr	Ramp waveform	Decelerating		
CVC depth	50 to 60mm	Volume Control	3kg	4kg	5kg
Airtraq™	Size 0 (Grey)	Tidal volume (mL)	18	24	30
		Minute volume (L)	0.9	1.2	1.5
		Pressure Control	3kg	4kg	5kg
		PIP (cmH ₂ O)	20		

Chart 5.11

Newborn / Small Infant				
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	3kg	4kg	5kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	2	3	4
Amikacin 25mg/kg loading dose	250mg/10mL (25mg/mL)	3	4	5
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	2	2.5	3
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	1.5	2	2.5
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	0.8	1	1.5
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	0.7	1	1.2
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	3	4	5
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	2.5	3	4
Cefepime 50mg/kg/dose bd	500mg/10mL (50mg/mL)	3	4	5
Ceftriaxone 100mg/kg/dose bd	500mg/10mL (50mg/mL)	6	8	10
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	3	4	5
Ciprofloxacin 10mg/kg/dose tds	100mg/50mL (2mg/mL)	15	20	25
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	3	4	5
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	3	4	5
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	0.6	0.8	1
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	1.5	2	2.5
Fluconazole 6mg/kg/dose od	2mg/mL solution	9	12	15
Gentamicin 8mg/kg loading dose	80mg/20mL (4mg/mL)	6	8	10
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	6	8	10
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	15	20	25
Meropenem 40mg/kg/dose tds	500mg/10mL (50mg/mL)	2	3	4
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	5	6	8
Penicillin G 100kU/kg/dose qid	1MU/10mL (100KU/mL)	3	4	5
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	4	5	6
Quinine 20mg/kg/dose loading dose	300mg/50mL D5W (6mg/mL)	10	13	17
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	3	4	5
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	6	8	10

Chart 5.12

3kg	3kg	3kg	3kg	3kg	3kg	3kg
Medication	Syringe (mL)		Preparation		mL	
Adenosine 1 st dose 0.1mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.3	
Adenosine next doses 0.2mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.6	
Adrenaline IM		1	1:1000 solution undiluted (1mg/mL)		0.1	
Adrenaline IV/IO 0.01mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.3	
Amiodarone 5mg/kg		10	150mg/3mL + 7mL dil. (15mg/mL)		1	
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		1	
Atropine for OP poisoning 0.05mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		1.5	
Biperiden 0.1mg/kg	1	10	5mg/1mL + 9mL dil. (0.5mg/mL)		0.6	
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				30	
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				17	
Calcium chloride 20mg/kg	1	10	1g/10mL undiluted (100mg/mL)		0.6	
Calcium gluconate 60mg/kg		10	1g/10mL undiluted (100mg/mL)		1.8	
Chlorpheniramine 0.1mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.3	
Clonazepam 0.02mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.6	
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				9	
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				3	
Defibrillation 4J/kg					12	
Dantrolene 1mg/kg		60	20mg in 60mL dil. (0.33mg/mL)		9	
Desmopressin 0.3µg/kg		10	4µg/1mL + 9mL dil. (0.4µg/mL)		2.5	
Dexamethasone 0.6mg/kg		5	4mg/2mL undiluted (2mg/mL)		0.9	
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)		0.1	
Diazepam PR 0.5mg/kg		1	10mg/2mL undiluted (5mg/mL)		0.3	
Digoxin 15µg/kg first dose		10	0.25mg/1mL + 9mL dil. (25µg/mL)		1.8	
Diphenhydramine 1mg/kg	1	10	50mg/1mL + 9mL dil. (5mg/mL)		0.6	
Ephedrine 0.3mg/kg	1	20	50mg/1mL + 19mL dil. (2.5mg/mL)		0.4	
Etomidate 0.3mg/kg	1	20	20mg/10mL + 10mL dil. (1mg/mL)		0.9	
Factor VIII concentrate			300IU/10mL give slowly IV		5	
Factor IX concentrate			500IU/10mL give slowly IV		5	

Chart 5.13

3kg	3kg	3kg	3kg	3kg	3kg	3kg
Medication	Syringe (mL)	Preparation	mL			
Fentanyl 1µg/kg	1 10	100µg/2mL + 8mL dil. (10µg/mL)	0.3			
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use	60			
Flumazenil 0.01mg/kg	1 10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	0.6			
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	2.5			
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use	45			
Furosemide 0.5mg/kg	1 10	20mg/2mL + 8mL dil. (2mg/mL)	0.8			
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	1.5			
Glucose (D25W) 0.5g/kg	20	10mL D50W + 10mL dil. (0.25g/mL)	6			
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	1.5			
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	1.2			
Insulin (soluble) 0.1U/kg	1	10U/0.1mL + 0.9mL dil. (10U/mL)	0.3			
Ketamine IV/IO 2mg/kg	1	10mg/mL undiluted	0.6			
Ketamine IM 4mg/kg	5	10mg/mL undiluted	1.2			
Ketofol 0.75mg/kg ketamine and propofol	1	mL of propofol 1% + ketamine 1%	0.2			
Ketorolac 0.5mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	-			
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.1			
Lidocaine 1mg/kg	1 10	100mg/5mL + 5mL dil. (10mg/mL)	0.3			
Lorazepam 0.1mg/kg	1 10	4mg/1mL + 7mL dil. (0.5mg/mL)	0.6			
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	1.2			
Maintenance fluids mL/hr			12			
Mannitol 1g/kg	20	25g/100mL undiluted (0.25g/mL)	12			
Methylene blue 1mg/kg	1 10	100mg/10mL undiluted (10mg/mL)	0.3			
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	1.5			
Midazolam IV/IO 0.1mg/kg	1 5	5mg/5mL undiluted (1mg/mL)	0.3			
Midazolam IM 0.2mg/kg	1	5mg/5mL undiluted (1mg/mL)	0.6			
Morphine 0.05mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.2			
N-acetylcysteine IV 150mg/kg	10	2g/10mL + 10mL dil. (100mg/mL)	4.5			
N-acetylcysteine PO 140mg/kg		400mg sachets	1			

Chart 5.14

3kg	3kg	3kg	3kg	3kg	3kg	3kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	1	0.4mg/mL undiluted	0.8			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	2.4			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	1			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	1			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	1			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	-			
Paracetamol 15mg/kg	10	10mg/mL undiluted	4.5			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	1.5			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	12			
Platelets 10mL/kg	Adjust dose to indication; warm before use			30		
Potassium IV/IO for severe hypokalaemia	1	KCl 15% (2mmol/mL) - give SLOWLY	1			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	1.5			
Procainamide 15mg/kg	1	10	1g/10mL undiluted (100mg/mL)	0.5		
Promethazine 0.5mg/kg	1	10	25mg/1mL + 9mL dil. (2.5mg/mL)	0.6		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	1			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	1.5			
Ranitidine 1mg/kg	1	10	50mg/2mL + 8mL dil. (5mg/mL)	0.6		
Rehydration – mild dehydration		mL/hr for 24hours	18			
Rehydration – moderate dehydration		mL/hr for 24hours	24			
Rehydration – severe dehydration		mL/hr for 24hours	30			
Rocuronium 1mg/kg	1	10	50mg/5mL + 5mL dil. (5mg/mL)	0.6		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	1			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	3			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	11			
Suxamethonium 3mg/kg	1	10	100mg/2mL + 8mL dil. (10mg/mL)	0.9		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	1.5			
Thiopentone 4mg/kg	1	20	500mg in 20mL dil. (25mg/mL)	0.5		
Tilidene 1mg/kg		drops of 2.5mg/drop solution	1			

Chart 5.15

3kg	3kg	3kg	3kg	3kg	3kg	3kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	1.5			
Toxic dose: lidocaine 1% + adrenaline			2			
Toxic dose: bupivacaine 0.5%			1.5			
Toxic dose: ropivacaine 0.75%			2			
Toxic dose: prilocaine 1%			2.4			
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	1			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	1.5			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	3			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	0.8			
Vecuronium 0.1mg/kg	10	4mg into 10mL dil. (0.4mg/mL)	1			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	1.5			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	5			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.1			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	0.42			
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	1.2			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	3			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.18			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.23			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	1.5			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.36			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.18			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.1			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.3			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	0.9			

Chart 5.16

4kg	4kg	4kg	4kg	4kg	4kg	4kg
Medication			Preparation			mL
Adenosine 1 st dose 0.1mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)			0.4
Adenosine next doses 0.2mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)			0.8
Adrenaline IM		1	1:1000 solution undiluted (1mg/mL)			0.1
Adrenaline IV/IO 0.01mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)			0.4
Amiodarone 5mg/kg		10	150mg/3mL + 7mL dil. (15mg/mL)			1.3
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)			1
Atropine for OP poisoning 0.05mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)			2
Biperiden 0.1mg/kg	1	10	5mg/1mL + 9mL dil. (0.5mg/mL)			0.8
Blood bolus 10mL/kg			Adjust dose to indication; warm before use			40
Blood packed cells transfusion			mL to ↑ Hb by 1g/dL			22
Calcium chloride 20mg/kg	1	10	1g/10mL undiluted (100mg/mL)			0.8
Calcium gluconate 60mg/kg		10	1g/10mL undiluted (100mg/mL)			2.4
Chlorpheniramine 0.1mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)			0.4
Clonazepam 0.02mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)			0.8
Cryoprecipitate 3mL/kg			Adjust dose to indication; warm before use			12
Cardioversion 1J/kg			Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.			4
Defibrillation 4J/kg						16
Dantrolene 1mg/kg		60	20mg in 60mL dil. (0.33mg/mL)			16
Desmopressin 0.3µg/kg		10	4µg/1mL + 9mL dil. (0.4µg/mL)			3
Dexamethasone 0.6mg/kg		5	4mg/2mL undiluted (2mg/mL)			1.2
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)			0.2
Diazepam PR 0.5mg/kg		1	10mg/2mL undiluted (5mg/mL)			0.4
Digoxin 15µg/kg first dose		10	0.25mg/1mL + 9mL dil. (25µg/mL)			2.4
Diphenhydramine 1mg/kg	1	10	50mg/1mL + 9mL dil. (5mg/mL)			0.8
Ephedrine 0.3mg/kg	1	20	50mg/1mL + 19mL dil. (2.5mg/mL)			0.5
Etomidate 0.3mg/kg		20	20mg/10mL + 10mL dil. (1mg/mL)			1.2
Factor VIII concentrate			300IU/10mL give slowly IV			7
Factor IX concentrate			500IU/10mL give slowly IV			7

Chart 5.17

4kg	4kg	4kg	4kg	4kg	4kg	4kg
Medication			Preparation			mL
Fentanyl 1µg/kg	1	10	100µg/2mL + 8mL dil. (10mg/mL)			0.4
Fluid bolus (warm fluids) 20mL/kg			Adjust dose to indication; warm before use			80
Flumazenil 0.01mg/kg	1	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)			0.8
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)			3.2
Fresh frozen plasma 15mL/kg			Adjust dose to indication; warm before use			60
Furosemide 0.5mg/kg	1	10	20mg/2mL + 8mL dil. (2mg/mL)			1
Glucagon 0.05mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)			2
Glucose (D25W) 0.5g/kg		20	10mL D50W + 10mL dil. (0.25g/mL)			8
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)			2
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)			1.6
Insulin (soluble) 0.1U/kg	1		10U/0.1mL + 0.9mL dil. (10U/mL)			0.4
Ketamine IV/IO 2mg/kg	1		10mg/mL undiluted			0.8
Ketamine IM 4mg/kg		5	10mg/mL undiluted			1.6
Ketofol 0.75mg/kg ketamine and propofol	1		mL of propofol 1% + ketamine 1%			0.3
Ketorolac 0.5mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)			-
Labetalol 0.2mg/kg		1	5mg/mL undiluted			0.2
Lidocaine 1mg/kg	1	10	100mg/5mL + 5mL dil. (10mg/mL)			0.4
Lorazepam 0.1mg/kg	1	10	4mg/1mL + 7mL dil. (0.5mg/mL)			0.8
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)			1.6
Maintenance fluids mL/hr						16
Mannitol 1g/kg		20	25g/100mL undiluted (0.25g/mL)			16
Methylene blue 1mg/kg	1	10	100mg/10mL undiluted (10mg/mL)			0.4
Methylprednisolone 2mg/kg		10	40mg/1mL + 9mL dil. (4mg/mL)			2
Midazolam IV/IO 0.1mg/kg	1	5	5mg/5mL undiluted (1mg/mL)			0.4
Midazolam IM 0.2mg/kg		1	5mg/5mL undiluted (1mg/mL)			0.8
Morphine 0.05mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)			0.2
N-acetylcysteine IV 150mg/kg		10	2g/10mL + 10mL dil. (100mg/mL)			6
N-acetylcysteine PO 140mg/kg			400mg sachets			1½

Chart 5.18

4kg	4kg	4kg	4kg	4kg	4kg	4kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	1	0.4mg/mL undiluted	1			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	3.2			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	1.3			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	1.5			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	1			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	-			
Paracetamol 15mg/kg	10	10mg/mL undiluted	6			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	2			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	16			
Platelets 10mL/kg	Adjust dose to indication; warm before use			40		
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	1.5			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	2			
Procainamide 15mg/kg	1	10	1g/10mL undiluted (100mg/mL)	0.6		
Promethazine 0.5mg/kg	1	10	25mg/1mL + 9mL dil. (2.5mg/mL)	0.8		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	1.2			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2			
Ranitidine 1mg/kg	1	10	50mg/2mL + 8mL dil. (5mg/mL)	0.8		
Rehydration – mild dehydration		mL/hr for 24hours	24			
Rehydration – moderate dehydration		mL/hr for 24hours	32			
Rehydration – severe dehydration		mL/hr for 24hours	41			
Rocuronium 1mg/kg	1	10	50mg/5mL + 5mL dil. (5mg/mL)	0.8		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	1.2			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	4			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	15			
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	1.2			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	1.5			
Thiopentone 4mg/kg	1	20	500mg in 20mL dil. (25mg/mL)	0.6		
Tilidene 1mg/kg		drops of 2.5mg/drop solution	2			

Chart 5.19

4kg	4kg	4kg	4kg	4kg	4kg	4kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	2			
Toxic dose: lidocaine 1% + adrenaline			2.5			
Toxic dose: bupivacaine 0.5%			2.5			
Toxic dose: ropivacaine 0.75%			3			
Toxic dose: prilocaine 1%			3.2			
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	1.2			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	2			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	4			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	1			
Vecuronium 0.1mg/kg	10	4mg into 10mL dil. (0.4mg/mL)	1			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	2			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	5			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.12			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	0.56			
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	1.6			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	4			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.24			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.3			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	2			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.48			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.24			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.12			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.4			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	1.2			

Chart 5.20

5kg	5kg	5kg	5kg	5kg	5kg	5kg
Medication		Syringe (mL)		Preparation		mL
Adenosine 1 st dose 0.1mg/kg		1	10	6mg/2mL + 4mL dil. (1mg/mL)		0.5
Adenosine next doses 0.2mg/kg		1	10	6mg/2mL + 4mL dil. (1mg/mL)		1
Adrenaline IM			1	1:1000 solution undiluted (1mg/mL)		0.1
Adrenaline IV/IO 0.01mg/kg		1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		0.5
Amiodarone 5mg/kg			10	150mg/3mL + 7mL dil. (15mg/mL)		1.7
Atropine 0.02mg/kg			5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		1
Atropine for OP poisoning 0.05mg/kg			5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		2.5
Biperiden 0.1mg/kg		1	10	5mg/1mL + 9mL dil. (0.5mg/mL)		1
Blood bolus 10mL/kg			Adjust dose to indication; warm before use			50
Blood packed cells transfusion			mL to ↑ Hb by 1g/dL			28
Calcium chloride 20mg/kg		1	10	1g/10mL undiluted (100mg/mL)		1
Calcium gluconate 60mg/kg			10	1g/10mL undiluted (100mg/mL)		3
Chlorpheniramine 0.1mg/kg		1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.5
Clonazepam 0.02mg/kg		1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		1
Cryoprecipitate 3mL/kg			Adjust dose to indication; warm before use			15
Cardioversion 1J/kg		Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				5
Defibrillation 4J/kg						20
Dantrolene 1mg/kg			60	20mg in 60mL dil. (0.33mg/mL)		20
Desmopressin 0.3µg/kg			10	4µg/1mL + 9mL dil. (0.4µg/mL)		3.5
Dexamethasone 0.6mg/kg			5	4mg/2mL undiluted (2mg/mL)		1.5
Diazepam IV/IO 0.2mg/kg			1	10mg/2mL undiluted (5mg/mL)		0.2
Diazepam PR 0.5mg/kg			1	10mg/2mL undiluted (5mg/mL)		0.5
Digoxin 15µg/kg first dose			10	0.25mg/1mL + 9mL dil. (25µg/mL)		3
Diphenhydramine 1mg/kg		1	10	50mg/1mL + 9mL dil. (5mg/mL)		1
Ephedrine 0.3mg/kg		1	20	50mg/1mL + 19mL dil. (2.5mg/mL)		0.6
Etomidate 0.3mg/kg			20	20mg/10mL + 10mL dil. (1mg/mL)		1.5
Factor VIII concentrate			300IU/10mL give slowly IV			8
Factor IX concentrate			500IU/10mL give slowly IV			9

Chart 5.21

5kg	5kg	5kg	5kg	5kg	5kg	5kg
Medication				Preparation		mL
Fentanyl 1µg/kg	1	10		100µg/2mL + 8mL dil. (10µg/mL)		0.5
Fluid bolus (warm fluids) 20mL/kg				Adjust dose to indication; warm before use		100
Flumazenil 0.01mg/kg	1	10		0.5mg/5mL + 5mL dil. (0.05mg/mL)		1
Fosphenytoin 20mg/kg		20		500mg/10mL + 10mL dil. (25mg/mL)		4
Fresh frozen plasma 15mL/kg				Adjust dose to indication; warm before use		75
Furosemide 0.5mg/kg	1	10		20mg/2mL + 8mL dil. (2mg/mL)		1.3
Glucagon 0.05mg/kg		10		1mg/1mL + 9mL dil. (0.1mg/mL)		2.5
Glucose (D25W) 0.5g/kg		20		10mL D50W + 10mL dil. (0.25g/mL)		10
Glycopyrrolate 0.01mg/kg		10		0.2mg/1mL + 9mL dil. (0.02mg/mL)		2.5
Hydrocortisone 4mg/kg		10		100mg/2mL + 8mL dil. (10mg/mL)		2
Insulin (soluble) 0.1U/kg	1			10U/0.1mL + 0.9mL dil. (10U/mL)		0.5
Ketamine IV/IO 2mg/kg	1			10mg/mL undiluted		1
Ketamine IM 4mg/kg		5		10mg/mL undiluted		2
Ketofol 0.75mg/kg ketamine and propofol	1			mL of propofol 1% + ketamine 1%		0.4
Ketorolac 0.5mg/kg	1	10		10mg/1mL + 9mL dil. (1mg/mL)		2.5
Labetalol 0.2mg/kg		1		5mg/mL undiluted		0.3
Lidocaine 1mg/kg	1	10		100mg/5mL + 5mL dil. (10mg/mL)		0.5
Lorazepam 0.1mg/kg	1	10		4mg/1mL + 7mL dil. (0.5mg/mL)		1
Magnesium sulphate 40mg/kg		10		1g/2mL + 8mL dil. (100mg/mL)		2
Maintenance fluids mL/hr						20
Mannitol 1g/kg		20		25g/100mL undiluted (0.25g/mL)		20
Methylene blue 1mg/kg	1	10		100mg/10mL undiluted (10mg/mL)		0.5
Methylprednisolone 2mg/kg		10		40mg/1mL + 9mL dil. (4mg/mL)		2.5
Midazolam IV/IO 0.1mg/kg	1	5		5mg/5mL undiluted (1mg/mL)		0.5
Midazolam IM 0.2mg/kg		1		5mg/5mL undiluted (1mg/mL)		1
Morphine 0.05mg/kg	1	10		10mg/1mL + 9mL dil. (1mg/mL)		0.3
N-acetylcysteine IV 150mg/kg		10		2g/10mL + 10mL dil. (100mg/mL)		7.5
N-acetylcysteine PO 140mg/kg				400mg sachets		2

Chart 5.22

5kg	5kg	5kg	5kg	5kg	5kg	5kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	1	0.4mg/mL undiluted	1.3			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	4			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	1.6			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	2			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	1.3			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	2.5			
Paracetamol 15mg/kg	10	10mg/mL undiluted	7.5			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	2.5			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	20			
Platelets 10mL/kg	Adjust dose to indication; warm before use			50		
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	1.8			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	2.5			
Procainamide 15mg/kg	1	10	1g/10mL undiluted (100mg/mL)	0.8		
Promethazine 0.5mg/kg	1	10	25mg/1mL + 9mL dil. (2.5mg/mL)	1		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	1.5			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2.5			
Ranitidine 1mg/kg	1	10	50mg/2mL + 8mL dil. (5mg/mL)	1		
Rehydration – mild dehydration		mL/hr for 24hours	30			
Rehydration – moderate dehydration		mL/hr for 24hours	40			
Rehydration – severe dehydration		mL/hr for 24hours	51			
Rocuronium 1mg/kg	1	10	50mg/5mL + 5mL dil. (5mg/mL)	1		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	1.5			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	5			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	19			
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	1.5			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	1.5			
Thiopentone 4mg/kg	1	20	500mg in 20mL dil. (25mg/mL)	1		
Tilidene 1mg/kg		drops of 2.5mg/drop solution	2			

Chart 5.23

5kg	5kg	5kg	5kg	5kg	5kg	5kg	
Medication			Preparation			mL	
Toxic dose: lidocaine 1%			Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks			2.5	
Toxic dose: lidocaine 1% + adrenaline						3.5	
Toxic dose: bupivacaine 0.5%						3	
Toxic dose: ropivacaine 0.75%						4	
Toxic dose: prilocaine 1%						4	
Tramadol 1.5mg/kg		20	100mg/2mL + 18mL dil. (5mg/mL)			1.5	
Tranexamic acid 25mg/kg		10	500mg/5mL + 5mL dil. (50mg/mL)			2.5	
Valproate 20mg/kg		20	400mg/4mL + 16mL dil. (20mg/mL)			5	
Vasopressin 0.5U/kg		1	10	20U/1mL + 9mL dil. (2U/mL)			1.2
Vecuronium 0.1mg/kg			10	4mg into 10mL dil. (0.4mg/mL)			1.3
Verapamil 0.25mg/kg			10	5mg/2mL + 8mL dil. (0.5mg/mL)			2.5
Vitamin K			10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)			5
Emergency Infusions - starting rates			Initiate at			mL/hr	
Adrenaline 10mg/10mL + 40mL dil.		50	0.1µg/kg/min			0.15	
Amiodarone 150mg/3mL + 47mL dil.		50	0.42mg/kg/hr			0.7	
Atropine 25mg/50mL undiluted		50	0.2mg/kg/hr			2	
Bicarbonate 8.5% undiluted		50	1meq/kg/hr			5	
Dobutamine 250mg/20mL + 30mL dil.		50	5µg/kg/min			0.3	
Dopamine 200mg/5mL + 45mL dil.		50	5µg/kg/min			0.38	
Labetalol 100mg/20mL + 30mL dil.		50	1mg/kg/hr			2.5	
Lidocaine 500mg/5mL + 45mL dil.		50	20µg/kg/min			0.6	
Nitroglycerin 25mg/5mL + 45mL dil.		50	0.5µg/kg/min			0.3	
Phenylephrine 10mg/1mL + 49mL dil.		50	0.1µg/kg/min			0.15	
Propofol 1% solution undiluted		50	1mg/kg/hr			0.5	
Thiopentone 500mg + 50mL dil.		50	50µg/kg/min			1.5	

Chart 5.24

Infant		6kg 7kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	0 to 1	Average BP (mmHg)	90/56
ETT size cuffed	-	Maximum SBP (mmHg)	110
ETT size uncuffed	3.0 to 3.5mm	Minimum SBP (mmHg)	70
ETT depth	10 to 10.5cm	Heart rate (per min)	123 (95, 148)
Introducer	6 Fr (2mm)	Respiratory rate (per min)	35 (24, 50)
Bougie	5 Fr (1.7mm)	Urine output (mL/hour)	12 to 14
Oropharyngeal airway	50mm / Size 0	Peak expiratory flow (L/min)	-
Nasopharyngeal airway	4.6 x 72mm	Body surface area (m ²)	0.34
Bag-valve resuscitator	Infant / Child	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Round 0 to 1		
Suction catheter	6 to 8 Fr		
Heat-moisture exchanger	± 2.5mL		
Intercostal drain size	10 to 12 Fr	F _{IO₂}	100%
Urethral catheter	8 Fr	Respiratory rate (per min)	40
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	5 to 7mm	I:E ratio	1:2
Nasogastric tube size	5 to 8 Fr	Inspiratory time (s)	0.5 (33%)
IV access	22 to 24G	PS / ASB (cmH ₂ O)	10
BP cuff	Newborn	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 1.5	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 1	Peak flow (L/min)	>10
CVC size	5 Fr	Ramp waveform	Decelerating
CVC depth	60 to 65mm	Volume Control	6kg 7kg
Airtraq™	Size 0 (Grey)	Tidal volume (mL)	36 42
		Minute volume (L)	1.44 1.68
		Pressure Control	6kg 7kg
		PIP (cmH ₂ O)	20

Chart 5.25

Infant			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	6kg	7kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	5	6
Amikacin 25mg/kg loading dose	250mg/10mL (25mg/mL)	6	7
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	3.5	4
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	3	4
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	1.5	2
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	1.4	1.7
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	6	7
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	5	6
Cefepime 50mg/kg/dose bd	500mg/10mL (50mg/mL)	6	7
Ceftriaxone 100mg/kg/dose bd	1g/20mL (50mg/mL)	12	14
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	6	7
Ciprofloxacin 10mg/kg/dose tds	100mg/50mL (2mg/mL)	30	35
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	6	7
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	6	7
Cotrimoxazole 0.2mL/kg/dose qid	mL undiluted (16mg/80mg/mL)	1	1
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	3	3.5
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	18	21
Gentamicin 8mg/kg loading dose	80mg/20mL (4mg/mL)	12	14
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	12	14
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	30	35
Meropenem 40mg/kg/dose tds	500mg/10mL (50mg/mL)	5	5.5
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	9	11
Penicillin G 100kU/kg/dose qid	1MU/10mL (100KU/mL)	6	7
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	8	9
Quinine 20mg/kg/dose loading dose	300mg/50mL D5W (6mg/mL)	20	23
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	6	7
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	12	14

Chart 5.26

6kg	6kg	6kg	6kg	6kg	6kg	6kg
Medication	Syringe (mL)	Preparation	mL			
Adenosine 1 st dose 0.1mg/kg	1 10	6mg/2mL + 4mL dil. (1mg/mL)	0.6			
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	1.2			
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.1			
Adrenaline IV/IO 0.01mg/kg	1 10	1mg/1mL + 9mL dil. (0.1mg/mL)	0.6			
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	2			
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	1.2			
Atropine for OP poisoning 0.05mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	3			
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	1.2			
Blood bolus 10mL/kg	Adjust dose to indication; warm before use		60			
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL		34			
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	1.2			
Calcium gluconate 60mg/kg	10	1g/10mL undiluted (100mg/mL)	3.6			
Chlorpheniramine 0.1mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.6			
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	1.2			
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use		18			
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.		6			
Defibrillation 4J/kg			24			
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)	18			
Desmopressin 0.3µg/kg	10	4µg/1mL + 9mL dil. (0.4µg/mL)	5			
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	1.8			
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.2			
Diazepam PR 0.5mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.6			
Digoxin 15µg/kg first dose	10	0.25mg/1mL + 9mL dil. (25µg/mL)	3.6			
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	1.2			
Ephedrine 0.3mg/kg	1 20	50mg/1mL + 19mL dil. (2.5mg/mL)	0.8			
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	2			
Factor VIII concentrate	500IU/10mL give slowly IV		6			
Factor IX concentrate	500IU/10mL give slowly IV		11			

Chart 5.27

6kg	6kg	6kg	6kg	6kg	6kg	6kg
Medication	Syringe (mL)	Preparation	mL			
Fentanyl 1µg/kg	1 10	100µg/2mL + 8mL dil. (10µg/mL)	0.6			
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use	120			
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	1.2			
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	5			
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use	90			
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	1.5			
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3			
Glucose (D25W) 0.5g/kg	20	10mL D50W + 10mL dil. (0.25g/mL)	12			
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	3			
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	2.5			
Insulin (soluble) 0.1U/kg	1	10U/0.1mL + 0.9mL dil. (10U/mL)	0.6			
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	1.2			
Ketamine IM 4mg/kg	1	50mg/mL undiluted	0.5			
Ketofol 0.75mg/kg ketamine and propofol	1	mL of propofol 1% + ketamine 1%	0.5			
Ketorolac 0.5mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	3			
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.2			
Lidocaine 1mg/kg	1 10	100mg/5mL + 5mL dil. (10mg/mL)	0.6			
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	1.2			
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	2.5			
Maintenance fluids mL/hr			24			
Mannitol 1g/kg	50	25g/100mL undiluted (0.25g/mL)	24			
Methylene blue 1mg/kg	1 10	100mg/10mL undiluted (10mg/mL)	0.6			
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	3			
Midazolam IV/IO 0.1mg/kg	1 5	5mg/5mL undiluted (1mg/mL)	0.6			
Midazolam IM 0.2mg/kg	5	5mg/5mL undiluted (1mg/mL)	1.2			
Morphine 0.05mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.4			
N-acetylcysteine IV 150mg/kg	10	2g/10mL + 10mL dil. (100mg/mL)	9			
N-acetylcysteine PO 140mg/kg		400mg sachets	2			

Chart 5.28

6kg	6kg	6kg	6kg	6kg	6kg	6kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	1.5			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	4.8			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	2			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	2.5			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	1.5			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	3			
Paracetamol 15mg/kg	10	10mg/mL undiluted	9			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	3			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	24			
Platelets 10mL/kg	Adjust dose to indication; warm before use			60		
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	2			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	3			
Procainamide 15mg/kg	1	1g/10mL undiluted (100mg/mL)	1			
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	1.2			
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	2			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3			
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	1.2			
Rehydration – mild dehydration		mL/hr for 24hours	36			
Rehydration – moderate dehydration		mL/hr for 24hours	49			
Rehydration – severe dehydration		mL/hr for 24hours	61			
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	1.2			
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	2			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	6			
Sodium replacement		mL of NS0.9% to ↑ Na ⁺ by 1mmol/L	23			
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	1.8			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	2			
Thiopentone 4mg/kg	1	500mg in 20mL dil. (25mg/mL)	1			
Tilidene 1mg/kg		drops of 2.5mg/drop solution	2			

Chart 5.29

6kg	6kg	6kg	6kg	6kg	6kg	6kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	3			
Toxic dose: lidocaine 1% + adrenaline			4			
Toxic dose: bupivacaine 0.5%			3.5			
Toxic dose: ropivacaine 0.75%			4			
Toxic dose: prilocaine 1%			4.8			
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	2			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	3			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	6			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	1.5			
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	1.5			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	3			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	5			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.18			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	0.8			
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	2.4			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	6			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.36			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.45			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	3			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.72			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.36			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.2			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.6			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	1.8			

Chart 5.30

7kg	7kg	7kg	7kg	7kg	7kg	7kg
Medication	Syringe (mL)	Preparation	mL			
Adenosine 1 st dose 0.1mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)	0.7		
Adenosine next doses 0.2mg/kg		10	6mg/2mL + 4mL dil. (1mg/mL)	1.4		
Adrenaline IM		1	1:1000 solution undiluted (1mg/mL)	0.1		
Adrenaline IV/IO 0.01mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)	0.7		
Amiodarone 5mg/kg		10	150mg/3mL + 7mL dil. (15mg/mL)	2.5		
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	1.4		
Atropine for OP poisoning 0.05mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	3.5		
Biperiden 0.1mg/kg		10	5mg/1mL + 9mL dil. (0.5mg/mL)	1.4		
Blood bolus 10mL/kg		Adjust dose to indication; warm before use		70		
Blood packed cells transfusion		mL to ↑ Hb by 1g/dL		40		
Calcium chloride 20mg/kg		10	1g/10mL undiluted (100mg/mL)	1.4		
Calcium gluconate 60mg/kg		10	1g/10mL undiluted dil. (100mg/mL)	4		
Chlorpheniramine 0.1mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)	0.7		
Clonazepam 0.02mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)	1.4		
Cryoprecipitate 3mL/kg		Adjust dose to indication; warm before use		21		
Cardioversion 1J/kg		Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.		7		
Defibrillation 4J/kg				28		
Dantrolene 1mg/kg		60	20mg in 60mL dil. (0.33mg/mL)	21		
Desmopressin 0.3µg/kg		10	4µg/1mL + 9mL dil. (0.4µg/mL)	5.5		
Dexamethasone 0.6mg/kg		5	4mg/2mL undiluted (2mg/mL)	2		
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)	0.3		
Diazepam PR 0.5mg/kg		1	10mg/2mL undiluted (5mg/mL)	0.6		
Digoxin 15µg/kg first dose		10	0.25mg/1mL + 9mL dil. (25µg/mL)	4		
Diphenhydramine 1mg/kg		10	50mg/1mL + 9mL dil. (5mg/mL)	1.4		
Ephedrine 0.3mg/kg	1	20	50mg/1mL + 19mL dil. (2.5mg/mL)	0.8		
Etomidate 0.3mg/kg		20	20mg/10mL + 10mL dil. (1mg/mL)	2		
Factor VIII concentrate		500IU/10mL give slowly IV		7		
Factor IX concentrate		500IU/10mL give slowly IV		13		

Chart 5.31

7kg	7kg	7kg	7kg	7kg	7kg	7kg
Medication	Syringe (mL)	Preparation	mL			
Fentanyl 1µg/kg	1 10	100µg/2mL + 8mL dil. (10µg/mL)	0.7			
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use	140			
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	1.4			
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	6			
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use	105			
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	2			
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3.5			
Glucose (D25W) 0.5g/kg	20	10mL D50W + 10mL dil. (0.25g/mL)	14			
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	3.5			
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	3			
Insulin (soluble) 0.1U/kg	1	10U/0.1mL + 0.9mL dil. (10U/mL)	0.7			
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	1.4			
Ketamine IM 4mg/kg	1	50mg/mL undiluted	0.6			
Ketofol 0.75mg/kg ketamine and propofol	1	mL of propofol 1% + ketamine 1%	0.5			
Ketorolac 0.5mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	3.5			
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.3			
Lidocaine 1mg/kg	1 10	100mg/5mL + 5mL dil. (10mg/mL)	0.7			
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	1.4			
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	3			
Maintenance fluids mL/hr			28			
Mannitol 1g/kg	50	25g/100mL undiluted (0.25g/mL)	28			
Methylene blue 1mg/kg	1 10	100mg/10mL undiluted (10mg/mL)	0.7			
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	3.5			
Midazolam IV/IO 0.1mg/kg	1 5	5mg/5mL undiluted (1mg/mL)	0.7			
Midazolam IM 0.2mg/kg	5	5mg/5mL undiluted (1mg/mL)	1.4			
Morphine 0.05mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.4			
N-acetylcysteine IV 150mg/kg	10	2g/10mL + 10mL dil. (100mg/mL)	11			
N-acetylcysteine PO 140mg/kg		400mg sachets	2½			

Chart 5.32

7kg	7kg	7kg	7kg	7kg	7kg	7kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	1.8			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	5.6			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	2.2			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	2.5			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	2			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	3.5			
Paracetamol 15mg/kg	10	10mg/mL undiluted	11			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	3.5			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	28			
Platelets 10mL/kg	Adjust dose to indication; warm before use			70		
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	2.5			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	3.5			
Procainamide 15mg/kg	1	10	1g/10mL undiluted (100mg/mL)	1		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	1.4			
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	2			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (1mg/mL)	3.5			
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	1.4			
Rehydration – mild dehydration		mL/hr for 24hours	42			
Rehydration – moderate dehydration		mL/hr for 24hours	57			
Rehydration – severe dehydration		mL/hr for 24hours	71			
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	1.4			
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	2			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	7			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	27			
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	2.1			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	2			
Thiopentone 4mg/kg	1	20	500mg in 20mL dil. (25mg/mL)	1		
Tilidine 1mg/kg		drops of 2.5mg/drop solution	3			

Chart 5.33

7kg	7kg	7kg	7kg	7kg	7kg	7kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	3.5			
Toxic dose: lidocaine 1% + adrenaline			5			
Toxic dose: bupivacaine 0.5%			4			
Toxic dose: ropivacaine 0.75%			6			
Toxic dose: prilocaine 1%			5.5			
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	2			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	3.5			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	7			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	2			
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	2			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	3.5			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	5			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.21			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	1			
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	2.8			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	7			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.42			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.53			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	3.5			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.84			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.42			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.2			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.7			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	2.1			

Chart 5.34

Infant		8kg	9kg
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	1	Average BP (mmHg)	90/56
ETT size cuffed	3.0mm	Maximum SBP (mmHg)	110
ETT size uncuffed	3.5 to 4.0mm	Minimum SBP (mmHg)	70
ETT depth	10.5 to 12cm	Heart rate (per min)	123 (95, 148)
Introducer	6 Fr (2mm)	Respiratory rate (per min)	35 (24, 50)
Bougie	5 Fr (1.7mm)	Urine output (mL/hour)	16 to 18
Oropharyngeal airway	50mm / Size 0	Peak expiratory flow (L/min)	-
Nasopharyngeal airway	4.6 x 72mm	Body surface area (m ²)	0.41
Bag-valve resuscitator	Infant / Child	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Round 1		
Suction catheter	6 to 8 Fr		
Heat-moisture exchanger	± 2.5mL		
Intercostal drain size	10 to 12 Fr	F _{O₂}	100%
Urethral catheter	8 Fr	Respiratory rate (per min)	40
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	5 to 7mm	I:E ratio	1:2
Nasogastric tube size	5 to 8 Fr	Inspiratory time (s)	0.5 (33%)
IV access	22 to 24G	PS / ASB (cmH ₂ O)	10
BP cuff	Infant	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 1.5	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 1	Peak flow (L/min)	>10
CVC size	5 to 7 Fr	Ramp waveform	Decelerating
CVC depth	65 to 75mm	Volume Control	8kg 9kg
Airtraq™	Size 0 (Grey)	Tidal volume (mL)	48 54
		Minute volume (L)	1.92 2.16
		Pressure Control	8kg 9kg
		PIP (cmH ₂ O)	20

Chart 5.35

Infant			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	8kg	9kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	6	7
Amikacin 25mg/kg loading dose	250mg/10mL (25mg/mL)	8	9
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	5	5
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	4	5
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	2	2.5
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	1.9	2.2
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	8	9
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	6	7
Cefepime 50mg/kg/dose bd	500mg/10mL (50mg/mL)	8	9
Ceftriaxone 100mg/kg/dose bd	1g/20mL (50mg/mL)	16	18
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	8	9
Ciprofloxacin 10mg/kg/dose tds	100mg/50mL (2mg/mL)	40	45
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	8	9
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	8	9
Cotrimoxazole 0.2mL/kg/dose qid	mL undiluted (16mg/80mg/mL)	2	2
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	4	4.5
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	24	27
Gentamicin 8mg/kg loading dose	80mg/20mL (4mg/mL)	16	18
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	16	18
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	40	45
Meropenem 40mg/kg/dose tds	500mg/10mL (50mg/mL)	6	7
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	12	14
Penicillin G 100kU/kg/dose qid	1MU/10mL (100KU/mL)	8	9
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	10	11
Quinine 20mg/kg/dose loading dose	300mg/50mL D5W (6mg/mL)	27	30
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	8	9
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	16	18

Chart 5.36

8kg	8kg	8kg	8kg	8kg	8kg	8kg
Medication	Syringe (mL)	Preparation	mL			
Adenosine 1 st dose 0.1mg/kg	1 10	6mg/2mL + 4mL dil. (1mg/mL)	0.8			
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	1.6			
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.1			
Adrenaline IV/IO 0.01mg/kg	1 10	1mg/1mL + 9mL dil. (0.1mg/mL)	0.8			
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	3			
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	1.5			
Atropine for OP poisoning 0.05mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	4			
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	1.5			
Blood bolus 10mL/kg	Adjust dose to indication; warm before use		80			
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL		45			
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	1.5			
Calcium gluconate 60mg/kg	10	1g/10mL undiluted (100mg/mL)	5			
Chlorpheniramine 0.1mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.8			
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	1.5			
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use		24			
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.		8			
Defibrillation 4J/kg			32			
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)	24			
Desmopressin 0.3µg/kg	10	4µg/1mL + 9mL dil. (0.4µg/mL)	6			
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	2.4			
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.3			
Diazepam PR 0.5mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.8			
Digoxin 15µg/kg first dose	10	0.25mg/1mL + 9mL dil. (25µg/mL)	5			
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	1.6			
Ephedrine 0.3mg/kg	1 20	50mg/1mL + 19mL dil. (2.5mg/mL)	1			
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	2.5			
Factor VIII concentrate	500IU/10mL give slowly IV		8			
Factor IX concentrate	500IU/10mL give slowly IV		14			

Chart 5.37

8kg	8kg	8kg	8kg	8kg	8kg	8kg
Medication	Syringe (mL)	Preparation	mL			
Fentanyl 1µg/kg	1 10	100µg/2mL + 8mL dil. (10µg/mL)	0.8			
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use	160			
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	1.6			
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	6			
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use	120			
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	2			
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4			
Glucose (D25W) 0.5g/kg	20	10mL D50W + 10mL dil. (0.25g/mL)	16			
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	4			
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	3			
Insulin (soluble) 0.1U/kg	1	10U/0.1mL + 0.9mL dil. (10U/mL)	0.8			
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	1.6			
Ketamine IM 4mg/kg	1	50mg/mL undiluted	0.6			
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	0.6			
Ketorolac 0.5mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	4			
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.3			
Lidocaine 1mg/kg	1 10	100mg/5mL + 5mL dil. (10mg/mL)	0.8			
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	1.6			
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	3			
Maintenance fluids mL/hr			32			
Mannitol 1g/kg	50	25g/100mL undiluted (0.25g/mL)	32			
Methylene blue 1mg/kg	1 10	100mg/10mL undiluted (10mg/mL)	0.8			
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	4			
Midazolam IV/IO 0.1mg/kg	1 5	5mg/5mL undiluted (1mg/mL)	0.8			
Midazolam IM 0.2mg/kg	5	5mg/5mL undiluted (1mg/mL)	1.6			
Morphine 0.05mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.4			
N-acetylcysteine IV 150mg/kg	10	2g/10mL + 10mL dil. (100mg/mL)	12			
N-acetylcysteine PO 140mg/kg		400mg sachets	2½			

Chart 5.38

8kg	8kg	8kg	8kg	8kg	8kg	8kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	2			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	6.5			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	3			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	3			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	2			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	4			
Paracetamol 15mg/kg	10	10mg/mL undiluted	12			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	4			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	32			
Platelets 10mL/kg	Adjust dose to indication; warm before use			80		
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	3			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	4			
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	1.2			
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	1.5			
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	2.5			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4			
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	1.6			
Rehydration – mild dehydration		mL/hr for 24hours	48			
Rehydration – moderate dehydration		mL/hr for 24hours	65			
Rehydration – severe dehydration		mL/hr for 24hours	82			
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	2			
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	2.5			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	8			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	31			
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	2.5			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	2.5			
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	1.5			
Tilidine 1mg/kg		drops of 2.5mg/drop solution	3			

Chart 5.39

8kg	8kg	8kg	8kg	8kg	8kg	8kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	4			
Toxic dose: lidocaine 1% + adrenaline			6			
Toxic dose: bupivacaine 0.5%			5			
Toxic dose: ropivacaine 0.75%			6			
Toxic dose: prilocaine 1%			6.5			
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	2.5			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	4			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	8			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	2			
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	2			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	4			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	5			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.24			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	1.1			
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	3.2			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	8			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.48			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.6			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	4			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	0.96			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.48			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.24			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.8			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	2.4			

Chart 5.40

9kg	9kg	9kg	9kg	9kg	9kg	9kg
Medication	Syringe (mL)	Preparation	mL			
Adenosine 1 st dose 0.1mg/kg	1 10	6mg/2mL + 4mL dil. (1mg/mL)	0.9			
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	1.8			
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.1			
Adrenaline IV/IO 0.01mg/kg	1 10	1mg/1mL + 9mL dil. (0.1mg/mL)	0.9			
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	3			
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	2			
Atropine for OP poisoning 0.05mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5			
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	2			
Blood bolus 10mL/kg	Adjust dose to indication; warm before use		90			
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL		50			
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	2			
Calcium gluconate 60mg/kg	10	1g/10mL undiluted dil. (100mg/mL)	5.5			
Chlorpheniramine 0.1mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.9			
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2			
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use		27			
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.		9			
Defibrillation 4J/kg			36			
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)	27			
Desmopressin 0.3µg/kg	10	4µg/1mL + 9mL dil. (0.4µg/mL)	7			
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	2.7			
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.4			
Diazepam PR 0.5mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.9			
Digoxin 15µg/kg first dose	10	0.25mg/1mL + 9mL dil. (25µg/mL)	5			
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	1.8			
Ephedrine 0.3mg/kg	1 20	50mg/1mL + 19mL dil. (2.5mg/mL)	1			
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	3			
Factor VIII concentrate	500IU/10mL give slowly IV		9			
Factor IX concentrate	500IU/10mL give slowly IV		16			

Chart 5.41

9kg	9kg	9kg	9kg	9kg	9kg	9kg
Medication	Syringe (mL)	Preparation	mL			
Fentanyl 1µg/kg	1 10	100µg/2mL + 8mL dil. (10µg/mL)	0.9			
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use	180			
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	1.8			
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	7			
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use	135			
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	2.5			
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4.5			
Glucose (D25W) 0.5g/kg	20	10mL D50W + 10mL dil. (0.25g/mL)	18			
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	4.5			
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	3.5			
Insulin (soluble) 0.1U/kg	1	10U/0.1mL + 0.9mL dil. (10U/mL)	0.9			
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	1.8			
Ketamine IM 4mg/kg	1	50mg/mL undiluted	0.7			
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	0.7			
Ketorolac 0.5mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	4.5			
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.4			
Lidocaine 1mg/kg	1 10	100mg/5mL + 5mL dil. (10mg/mL)	0.9			
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	1.8			
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	3.5			
Maintenance fluids mL/hr			36			
Mannitol 1g/kg	50	25g/100mL undiluted (0.25g/mL)	36			
Methylene blue 1mg/kg	1 10	100mg/10mL undiluted (10mg/mL)	0.9			
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	4.5			
Midazolam IV/IO 0.1mg/kg	1 5	5mg/5mL undiluted (1mg/mL)	0.9			
Midazolam IM 0.2mg/kg	5	5mg/5mL undiluted (1mg/mL)	1.8			
Morphine 0.05mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	0.5			
N-acetylcysteine IV 150mg/kg	10	2g/10mL + 10mL dil. (100mg/mL)	14			
N-acetylcysteine PO 140mg/kg		400mg sachets	3			

Chart 5.42

9kg	9kg	9kg	9kg	9kg	9kg	9kg
Medication	Syringe (mL)	Preparation	mL			
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	2.5			
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	7			
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	3			
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	3.5			
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	2.5			
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (40mg/mL)	4.5			
Paracetamol 15mg/kg	10	10mg/mL undiluted	14			
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	4.5			
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	36			
Platelets 10mL/kg	Adjust dose to indication; warm before use			90		
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	3.5			
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	4.5			
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	1.4			
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	2			
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	3			
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4.5			
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	1.8			
Rehydration – mild dehydration		mL/hr for 24hours	54			
Rehydration – moderate dehydration		mL/hr for 24hours	73			
Rehydration – severe dehydration		mL/hr for 24hours	92			
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	2			
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	3			
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	9			
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	35			
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	2.5			
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	2.5			
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	2			
Tilidine 1mg/kg		drops of 2.5mg/drop solution	4			

Chart 5.43

9kg	9kg	9kg	9kg	9kg	9kg	9kg
Medication	Syringe (mL)	Preparation	mL			
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	5			
Toxic dose: lidocaine 1% + adrenaline			6			
Toxic dose: bupivacaine 0.5%			5			
Toxic dose: ropivacaine 0.75%			7			
Toxic dose: prilocaine 1%			7			
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	3			
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	4.5			
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	9			
Vasopressin 0.5U/kg	1 10	20U/1mL + 9mL dil. (2U/mL)	2			
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	2.5			
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	4.5			
Vitamin K	10	2mg/0.2mL + 9.8mL dil. (0.2mg/mL)	5			
Emergency Infusions - starting rates		Initiate at	mL/hr			
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.27			
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	1.3			
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	3.6			
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	9			
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.54			
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.68			
Labetalol 100mg/20mL + 30mL dil.	50	1mg/kg/hr	4.5			
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	1.08			
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.54			
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.27			
Propofol 1% solution undiluted	50	1mg/kg/hr	0.9			
Thiopentone 500mg + 50mL dil.	50	50µg/kg/min	2.7			

Chart 5.44

Toddler		10kg 11kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	1	Average BP (mmHg)	92/56
ETT size cuffed	3.0mm	Maximum SBP (mmHg)	110
ETT size uncuffed	4.0mm	Minimum SBP (mmHg)	72
ETT depth	11 to 12cm	Heart rate (per min)	116 (90, 142)
Introducer	6 Fr (2mm)	Respiratory rate (per min)	31 (22, 43)
Bougie	8 Fr (2.7mm)	Urine output (mL/hour)	15 to 17
Oropharyngeal airway	60mm / Size 1	Peak expiratory flow (L/min)	-
Nasopharyngeal airway	5.3 x 85mm	Body surface area (m ²)	0.48
Bag-valve resuscitator	Child	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 1 to 2		
Suction catheter	10 Fr		
Heat-moisture exchanger	± 12mL		
Intercostal drain size	16 to 20 Fr	F _I O ₂	100%
Urethral catheter	8 to 10 Fr	Respiratory rate (per min)	30
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	7mm	I:E ratio	1:2
Nasogastric tube size	8 to 10 Fr	Inspiratory time (s)	0.67 (33%)
IV access	20 to 24G	PS / ASB (cmH ₂ O)	10
BP cuff	Child	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 2	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 1	Peak flow (L/min)	>15
CVC size	5 to 7 Fr	Ramp waveform	Decelerating
CVC depth	70 to 80mm	Volume Control	10kg 11kg
Airtraq™	Size 1 (Purple)	Tidal volume (mL)	60 66
		Minute volume (L)	1.8 1.98
		Pressure Control	10kg 11kg
		PIP (cmH ₂ O)	20

Chart 5.45

Toddler			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	10kg	11kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	8	9
Amikacin 25mg/kg loading dose	500mg/10mL (25mg/mL)	5	5.5
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	6	6.5
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	5	6
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	2.5	3
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	2.4	2.5
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	10	11
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	8	9
Cefepime 50mg/kg/dose bd	500mg/10mL (50mg/mL)	10	10
Ceftriaxone 100mg/kg/dose bd	1g/20mL (50mg/mL)	20	20
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	11	12
Ciprofloxacin 10mg/kg/dose tds	200mg/100mL (2mg/mL)	50	55
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	10	11
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	10	11
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	2	2
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	5	5.5
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	30	33
Gentamicin 8mg/kg loading dose	80mg/20mL (4mg/mL)	20	20
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	20	22
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	50	55
Meropenem 40mg/kg/dose tds	500mg/10mL (50mg/mL)	8	9
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	15	17
Penicillin G 100kU/kg/dose qid	1MU/10mL (100KU/mL)	10	10
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	13	14
Quinine 20mg/kg/dose loading dose	300mg/50mL D5W (6mg/mL)	33	37
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	10	11
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	20	22

Chart 5.46

10kg	10kg	10kg	10kg	10kg	10kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	1 10	6mg/2mL + 4mL dil. (1mg/mL)	1		
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	2		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.1		
Adrenaline IV/IO 0.01mg/kg	1 10	1mg/1mL + 9mL dil. (0.1mg/mL)	1		
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	3.5		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	2		
Atropine for OP poisoning 0.05mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	2		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use			100	
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL			57	
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	2		
Calcium gluconate 60mg/kg	10	1g/10mL undiluted (100mg/mL)	6		
Chlorpheniramine 0.1mg/kg	1 10	10mg/1mL + 9mL dil. (1mg/mL)	1		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use			30	
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.			10	
Defibrillation 4J/kg				40	
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)	30		
Desmopressin 0.3µg/kg	10	4µg/1mL + 9mL dil. (0.4µg/mL)	8		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	3		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.5		
Diazepam PR 0.5mg/kg	1	10mg/2mL undiluted (5mg/mL)	1		
Digoxin 15µg/kg first dose	10	0.25mg/1mL + 9mL dil. (25µg/mL)	6		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	2		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	1.2		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	3		
Factor VIII concentrate	500IU/10mL give slowly IV			10	
Factor IX concentrate	500IU/10mL give slowly IV			18	

Chart 5.47

10kg	10kg	10kg	10kg	10kg	10kg
Medication	Syringe (mL)		Preparation		mL
Fentanyl 1µg/kg	1	10	100µg/2mL + 8mL dil. (10µg/mL)		1
Fluid bolus (warm fluids) 20mL/kg			Adjust dose to indication; warm before use		200
Flumazenil 0.01mg/kg		10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		2
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		8
Fresh frozen plasma 15mL/kg			Adjust dose to indication; warm before use		150
Furosemide 0.5mg/kg		10	20mg/2mL + 8mL dil. (2mg/mL)		2.5
Glucagon 0.05mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		5
Glucose (D25W) 0.5g/kg		20	10mL D50W + 10mL dil. (0.25g/mL)		20
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		5
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)		4
Insulin (soluble) 0.1U/kg		1	10U/0.1mL undiluted		0.1
Ketamine IV/IO 2mg/kg		5	10mg/mL undiluted		2
Ketamine IM 4mg/kg		1	50mg/mL undiluted		0.8
Ketofol 0.75mg/kg ketamine and propofol		5	mL of propofol 1% + ketamine 1%		0.8
Ketorolac 0.5mg/kg		10	10mg/1mL + 9mL dil. (1mg/mL)		5
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.4
Lidocaine 1mg/kg	1	10	100mg/5mL + 5mL dil. (10mg/mL)		1
Lorazepam 0.1mg/kg		10	4mg/1mL + 7mL dil. (0.5mg/mL)		2
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)		4
Maintenance fluids mL/hr					40
Mannitol 1g/kg		50	25g/100mL undiluted (0.25g/mL)		40
Methylene blue 1mg/kg	1	10	100mg/10mL undiluted (10mg/mL)		1
Methylprednisolone 2mg/kg		10	40mg/1mL + 9mL dil. (4mg/mL)		5
Midazolam IV/IO 0.1mg/kg	1	5	5mg/5mL undiluted (1mg/mL)		1
Midazolam IM 0.2mg/kg		5	5mg/5mL undiluted (1mg/mL)		2
Morphine 0.05mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.5
N-acetylcysteine IV 150mg/kg		20	2g/10mL + 10mL dil. (100mg/mL)		15
N-acetylcysteine PO 140mg/kg			400mg sachets		3½

Chart 5.48

10kg	10kg	10kg	10kg	10kg	10kg
Medication		Syringe (mL)	Preparation		mL
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted			2.5
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)			8
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)			3.5
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)			4
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)			2.5
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (0.4mg/mL)			5
Paracetamol 15mg/kg	10	10mg/mL undiluted			15
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)			5
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)			40
Platelets 10mL/kg	Adjust dose to indication; warm before use				100
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY			4
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)			5
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)			1.5
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)			2
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)			3
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)			5
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)			2
Rehydration – mild dehydration		mL/hr for 24hours			60
Rehydration – moderate dehydration		mL/hr for 24hours			81
Rehydration – severe dehydration		mL/hr for 24hours			102
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)			2
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)			3
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving			10
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L			38
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)			3
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)			3
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)			2
Tilidine 1mg/kg		drops of 2.5mg/drop solution			4

Chart 5.49

10kg	10kg	10kg	10kg	10kg	10kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	5		
Toxic dose: lidocaine 1% + adrenaline			7		
Toxic dose: bupivacaine 0.5%			6		
Toxic dose: ropivacaine 0.75%			5		
Toxic dose: prilocaine 1%			8		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	3		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	5		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	10		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	2.5		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	2.5		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	5		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	3		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.3		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	1.4		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	4		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	10		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.6		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.75		
Labetalol 400mg/40mL + 10mL dil.	50	1mg/kg/hr	1.25		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	1.2		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.6		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.3		
Propofol 1% solution undiluted	50	1mg/kg/hr	1		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	0.75		

Chart 5.50

11kg	11kg	11kg	11kg	11kg	11kg
Medication		Syringe (mL)		Preparation	mL
Adenosine 1 st dose 0.1mg/kg	1	10	6mg/2mL + 4mL dil. (1mg/mL)		1
Adenosine next doses 0.2mg/kg		10	6mg/2mL + 4mL dil. (1mg/mL)		2
Adrenaline IM		1	1:1000 solution undiluted (1mg/mL)		0.1
Adrenaline IV/IO 0.01mg/kg	1	10	1mg/1mL + 9mL dil. (0.1mg/mL)		1
Amiodarone 5mg/kg		10	150mg/3mL + 7mL dil. (15mg/mL)		3.8
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		2
Atropine for OP poisoning 0.05mg/kg		5	1mg/2mL + 8mL dil. (0.1mg/mL)		5.5
Biperiden 0.1mg/kg		10	5mg/1mL + 9mL dil. (0.5mg/mL)		2
Blood bolus 10mL/kg		Adjust dose to indication; warm before use			110
Blood packed cells transfusion			mL to ↑ Hb by 1g/dL		62
Calcium chloride 20mg/kg		10	1g/10mL undiluted (100mg/mL)		2
Calcium gluconate 60mg/kg		10	1g/10mL undiluted (100mg/mL)		6.5
Chlorpheniramine 0.1mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		1
Clonazepam 0.02mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		2
Cryoprecipitate 3mL/kg		Adjust dose to indication; warm before use			33
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				11
			44		
Dantrolene 1mg/kg		60	20mg in 60mL dil. (0.33mg/mL)		33
Desmopressin 0.3µg/kg		10	4µg/1mL + 9mL dil. (0.4µg/mL)		9
Dexamethasone 0.6mg/kg		5	4mg/2mL undiluted (2mg/mL)		3
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)		0.5
Diazepam PR 0.5mg/kg		1	10mg/2mL undiluted (5mg/mL)		1
Digoxin 15µg/kg first dose		10	0.25mg/1mL + 9mL dil. (25µg/mL)		6.5
Diphenhydramine 1mg/kg		10	50mg/1mL + 9mL dil. (5mg/mL)		2
Ephedrine 0.3mg/kg		20	50mg/1mL + 19mL dil. (2.5mg/mL)		1.3
Etomidate 0.3mg/kg		20	20mg/10mL + 10mL dil. (1mg/mL)		3.5
Factor VIII concentrate			500IU/10mL give slowly IV		11
Factor IX concentrate			500IU/10mL give slowly IV		20

Chart 5.51

11kg	11kg	11kg	11kg	11kg	11kg
Medication	Syringe (mL)		Preparation		mL
Fentanyl 1µg/kg	1	10	100µg/2mL + 8mL dil. (10µg/mL)		1
Fluid bolus (warm fluids) 20mL/kg			Adjust dose to indication; warm before use		220
Flumazenil 0.01mg/kg		10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		2
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		9
Fresh frozen plasma 15mL/kg			Adjust dose to indication; warm before use		165
Furosemide 0.5mg/kg		10	20mg/2mL + 8mL dil. (2mg/mL)		3
Glucagon 0.05mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		5.5
Glucose (D25W) 0.5g/kg		50	25mL D50W + 25mL dil. (0.25g/mL)		22
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		5.5
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)		4.5
Insulin (soluble) 0.1U/kg		1	10U/0.1mL undiluted		0.1
Ketamine IV/IO 2mg/kg		5	10mg/mL undiluted		2.2
Ketamine IM 4mg/kg		1	50mg/mL undiluted		1
Ketofol 0.75mg/kg ketamine and propofol		5	mL of propofol 1% + ketamine 1%		0.9
Ketorolac 0.5mg/kg		10	10mg/1mL + 9mL dil. (1mg/mL)		5.5
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.4
Lidocaine 1mg/kg	1	10	100mg/5mL + 5mL dil. (10mg/mL)		1
Lorazepam 0.1mg/kg		10	4mg/1mL + 7mL dil. (0.5mg/mL)		2
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)		4.5
Maintenance fluids mL/hr					42
Mannitol 1g/kg		50	25g/100L undiluted (0.25g/mL)		44
Methylene blue 1mg/kg	1	10	100mg/10mL undiluted (10mg/mL)		1
Methylprednisolone 2mg/kg		10	40mg/1mL + 9mL dil. (4mg/mL)		5.5
Midazolam IV/IO 0.1mg/kg	1	5	5mg/5mL undiluted (1mg/mL)		1
Midazolam IM 0.2mg/kg		5	5mg/5mL undiluted (1mg/mL)		2
Morphine 0.05mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)		0.5
N-acetylcysteine IV 150mg/kg		20	2g/10mL + 10mL dil. (100mg/mL)		17
N-acetylcysteine PO 140mg/kg			400mg sachets		4

Chart 5.52

11kg	11kg	11kg	11kg	11kg	11kg
Medication	Sringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	2.8		
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	9		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	4		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	4.5		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	3		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	5.5		
Paracetamol 15mg/kg	10	10mg/mL undiluted	17		
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	5.5		
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	44		
Platelets 10mL/kg	Adjust dose to indication; warm before use				110
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	4		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	5.5		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	1.7		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	2		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	3.5		
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	5.5		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	2		
Rehydration – mild dehydration	mL/hr for 24hours				64
Rehydration – moderate dehydration	mL/hr for 24hours				87
Rehydration – severe dehydration	mL/hr for 24hours				110
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	2.5		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	3.5		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	11		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				42
Suxamethonium 3mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	3.5		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	3		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	2		
Tilidene 1mg/kg	drops of 2.5mg/drop solution				4

Chart 5.53

11kg	11kg	11kg	11kg	11kg	11kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	6		
Toxic dose: lidocaine 1% + adrenaline			8		
Toxic dose: bupivacaine 0.5%			7		
Toxic dose: ropivacaine 0.75%			5		
Toxic dose: prilocaine 1%			9		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	3.5		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	5.5		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	11		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	3		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	3		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	5.5		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	3		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.33		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	1.5		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	4.4		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	11		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.66		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.83		
Labetalol 400mg/40mL + 10mL dil.	50	1mg/kg/hr	1.38		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	1.3		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.66		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.33		
Propofol 1% solution undiluted	50	1mg/kg/hr	1.1		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	0.83		

Chart 5.54

Small Child		12kg 14kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	2	Average BP (mmHg)	94/55
ETT size cuffed	4.0mm	Maximum SBP (mmHg)	110
ETT size uncuffed	4.5mm	Minimum SBP (mmHg)	75
ETT depth	13.5cm	Heart rate (per min)	110 (84, 135)
Introducer	6 Fr (2mm)	Respiratory rate (per min)	28 (20, 36)
Bougie	8 Fr (2.7mm)	Urine output (mL/hour)	18 to 22
Oropharyngeal airway	60mm / Size 1	Peak expiratory flow (L/min)	-
Nasopharyngeal airway	5.3 x 85mm	Body surface area (m ²)	0.58
Bag-valve resuscitator	Child	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 2 to 3		
Suction catheter	10 Fr		
Heat-moisture exchanger	± 12mL		
Intercostal drain size	20 to 24 Fr	F _I O ₂	100%
Urethral catheter	10 Fr	Respiratory rate (per min)	30
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	10 to 15mm	I:E ratio	1:2
Nasogastric tube size	10 Fr	Inspiratory time (s)	0.67 (33%)
IV access	18 to 22G	PS / ASB (cmH ₂ O)	10
BP cuff	Child	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 2	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 2	Peak flow (L/min)	>15
CVC size	5 to 7 Fr	Ramp waveform	Decelerating
CVC depth	75 to 95mm	Volume Control	12kg 14kg
Airtraq™	Size 1 (Purple)	Tidal volume (mL)	72 84
		Minute volume (L)	2.16 2.52
		Pressure Control	12kg 14kg
		PIP (cmH ₂ O)	20

Chart 5.55

Small Child			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	12kg	14kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	10	11
Amikacin 25mg/kg loading dose	500mg/10mL (50mg/mL)	6	7
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	7	8
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	6	7
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	3	3.5
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	3	3
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	12	14
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	10	11
Cefepime 50mg/kg/dose bd	1g/20mL (50mg/mL)	12	14
Ceftriaxone 100mg/kg/dose bd	2g/20mL (100mg/mL)	12	14
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	13	15
Ciprofloxacin 10mg/kg/dose tds	200mg/100mL (2mg/mL)	60	70
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	12	14
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	12	14
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	2	3
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	6	7
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	36	42
Gentamicin 8mg/kg loading dose	160mg/20mL (8mg/mL)	12	14
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	24	28
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	60	70
Meropenem 40mg/kg/dose tds	1g/20mL (50mg/mL)	10	11
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	18	21
Penicillin G 100kU/kg/dose qid	2MU/20mL (100kU/mL)	12	14
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	15	18
Quinine 20mg/kg/dose loading dose	300mg/50mL D5W (6mg/mL)	40	47
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	12	14
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	24	28

Chart 5.56

12kg	12kg	12kg	12kg	12kg	12kg
Medication		Syringe (mL)	Preparation		mL
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)			1.2
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)			2.4
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)			0.2
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)			1.2
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)			4
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)			2.5
Atropine for OP poisoning 0.05mg/kg	10	1mg/2mL + 8mL dil. (0.1mg/mL)			6
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)			2.5
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				120
Blood packed cells transfusion		mL to ↑ Hb by 1g/dL			68
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)			2.5
Calcium gluconate 60mg/kg	10	1g/10mL undiluted (100mg/mL)			7
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)			1.2
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)			2.5
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				36
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				12
Defibrillation 4J/kg					48
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)			36
Desmopressin 0.3µg/kg	10	4µg/1mL + 9mL dil. (0.4µg/mL)			9
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)			3.5
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)			0.5
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)			1.2
Digoxin 15µg/kg first dose	10	0.25mg/1mL + 9mL dil. (25µg/mL)			7
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)			2.5
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)			1.4
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)			4
Factor VIII concentrate		500IU/10mL give slowly IV			12
Factor IX concentrate		500IU/10mL give slowly IV			22

Chart 5.57

12kg	12kg	12kg	12kg	12kg	12kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)	1.2		
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use				240
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	2.5		
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (50mg/mL)	10		
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use				180
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	3		
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	6		
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)	24		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	6		
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	5		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.1		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	2.4		
Ketamine IM 4mg/kg	1	50mg/mL undiluted	1		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	0.9		
Ketorolac 0.5mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	6		
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.5		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	1.2		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	2.5		
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	5		
Maintenance fluids mL/hr					44
Mannitol 1g/kg	50	25g/100mL undiluted (0.25g/mL)	48		
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	1.2		
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	6		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	1.2		
Midazolam IM 0.2mg/kg	5	5mg/5mL undiluted (1mg/mL)	2.4		
Morphine 0.05mg/kg	1	10mg/1mL + 9mL dil. (1mg/mL)	0.6		
N-acetylcysteine IV 150mg/kg	50	4g/20mL + 30mL dil. (80mg/mL)	23		
N-acetylcysteine PO 140mg/kg	400mg sachets				4

Chart 5.58

12kg	12kg	12kg	12kg	12kg	12kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	3		
Neostigmine 0.04mg/kg	10	0.5mg/1mL + 9mL dil. (0.05mg/mL)	10		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	4		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	5		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	3		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	6		
Paracetamol 15mg/kg	10	10mg/mL undiluted	18		
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	6		
Phenytoin 20mg/kg	50	250mg/5mL + 45mL dil. (5mg/mL)	48		
Platelets 10mL/kg	Adjust dose to indication; warm before use				120
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY	4.5		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	7		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	1.8		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	2.5		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	3.5		
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	6		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	2.5		
Rehydration – mild dehydration	mL/hr for 24hours				69
Rehydration – moderate dehydration	mL/hr for 24hours				90
Rehydration – severe dehydration	mL/hr for 24hours				119
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	2.5		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	3.5		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	12		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				46
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	2.5		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	4		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	2		
Tilidine 1mg/kg	drops of 2.5mg/drop solution				5

Chart 5.59

12kg	12kg	12kg	12kg	12kg	12kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	6		
Toxic dose: lidocaine 1% + adrenaline			8		
Toxic dose: bupivacaine 0.5%			7		
Toxic dose: ropivacaine 0.75%			6		
Toxic dose: prilocaine 1%			10		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	3.5		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	6		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	12		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	3		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	3		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	6		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	3		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.36		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	1.7		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	4.8		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	12		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.72		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	0.9		
Labetalol 400mg/40mL + 10mL dil.	50	1mg/kg/hr	1.5		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	1.4		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.72		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.36		
Propofol 1% solution undiluted	50	1mg/kg/hr	1.2		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	0.9		

Chart 5.60

14kg	14kg	14kg	14kg	14kg	14kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	1.4		
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	2.8		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.2		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	1.4		
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	4.5		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	3		
Atropine for OP poisoning 0.05mg/kg	10	1mg/2mL + 8mL dil. (0.1mg/mL)	7		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	3		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				140
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				80
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	3		
Calcium gluconate 60mg/kg	10	1g/10mL undiluted (100mg/mL)	8		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	1.4		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				42
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				14
Defibrillation 4J/kg					56
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)	42		
Desmopressin 0.3µg/kg	10	4µg/1mL + 9mL dil. (0.4µg/mL)	10		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	4		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.6		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	1.5		
Digoxin 15µg/kg first dose	10	0.25mg/1mL + 9mL dil. (25µg/mL)	9		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	3		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	1.7		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	4		
Factor VIII concentrate	500IU/10mL give slowly IV				14
Factor IX concentrate	500IU/10mL give slowly IV				25

Chart 5.61

14kg	14kg	14kg	14kg	14kg	14kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (100µg/mL)	1.4		
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use				280
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (1mg/mL)	3		
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	11		
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use				210
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	3.5		
Glucagon 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	7		
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)	28		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	7		
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	5.5		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.15		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	2.8		
Ketamine IM 4mg/kg	1	50mg/mL undiluted	1		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	1.1		
Ketorolac 0.5mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	7		
Labetalol 0.2mg/kg	1	5mg/mL undiluted	0.6		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	1.5		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	3		
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)	5.5		
Maintenance fluids mL/hr					48
Mannitol 1g/kg	25g/100mL undiluted (0.25g/mL)				56
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	1.4		
Methylprednisolone 2mg/kg	10	40mg/1mL + 9mL dil. (4mg/mL)	7		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	1.4		
Midazolam IM 0.2mg/kg	5	5mg/5mL undiluted (1mg/mL)	2.8		
Morphine 0.05mg/kg	1	10mg/1mL + 9mL dil. (1mg/mL)	0.7		
N-acetylcysteine IV 150mg/kg	50	4g/20mL + 30mL dil. (80mg/mL)	26		
N-acetylcysteine PO 140mg/kg	400mg sachets				5

Chart 5.62

14kg	14kg	14kg	14kg	14kg	14kg
Medication		Syringe (mL)	Preparation		mL
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted		3.5	
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)		2.2	
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)		4	
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)		5	
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)		4	
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)		7	
Paracetamol 15mg/kg	10	10mg/mL undiluted		21	
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)		7	
Phenytoin 20mg/kg	50	500mg/10mL + 40mL dil. (10mg/mL)		28	
Platelets 10mL/kg	Adjust dose to indication; warm before use			140	
Potassium IV/IO for severe hypokalaemia	5	KCl 15% (2mmol/mL) - give SLOWLY		5	
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)		7	
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)		2	
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)		3	
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)		4	
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)		7	
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)		3	
Rehydration – mild dehydration		mL/hr for 24hours		75	
Rehydration – moderate dehydration		mL/hr for 24hours		105	
Rehydration – severe dehydration		mL/hr for 24hours		135	
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)		3	
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)		4	
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving		14	
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L		54	
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)		3	
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)		4	
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)		2	
Tilidine 1mg/kg		drops of 2.5mg/drop solution		6	

Chart 5.63

14kg	14kg	14kg	14kg	14kg	14kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	7		
Toxic dose: lidocaine 1% + adrenaline			10		
Toxic dose: bupivacaine 0.5%			8		
Toxic dose: ropivacaine 0.75%			7.5		
Toxic dose: prilocaine 1%			11		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	4		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	7		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	14		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	4		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	4		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	6		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	3		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.42		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	2		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	5.6		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	14		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	0.84		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	1.1		
Labetalol 400mg/40mL + 10mL dil.	50	1mg/kg/hr	1.8		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	1.7		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.84		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.42		
Propofol 1% solution undiluted	50	1mg/kg/hr	1.4		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	1.1		

Chart 5.64

Child		16kg 18kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	2	Average BP (mmHg)	94/56
ETT size cuffed	4.5mm	Maximum SBP (mmHg)	112
ETT size uncuffed	5.0mm	Minimum SBP (mmHg)	78
ETT depth	14 to 15cm	Heart rate (per min)	104 (78, 129)
Introducer	6 Fr (2mm)	Respiratory rate (per min)	25 (19, 31)
Bougie	8 Fr (2.7mm)	Urine output (mL/hour)	30 to 33
Oropharyngeal airway	60mm / Size 1	Peak expiratory flow (L/min)	-
Nasopharyngeal airway	5.3 x 85mm	Body surface area (m ²)	0.69
Bag-valve resuscitator	Adult	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 3 to 4		
Suction catheter	10 Fr		
Heat-moisture exchanger	± 12mL		
Intercostal drain size	20 to 24 Fr	F _{O₂}	100%
Urethral catheter	10 to 12 Fr	Respiratory rate (per min)	30
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	10 to 15mm	I:E ratio	1:2
Nasogastric tube size	10 Fr	Inspiratory time (s)	0.67 (33%)
IV access	18 to 22G	PS / ASB (cmH ₂ O)	10
BP cuff	Child	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 2	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 2	Peak flow (L/min)	>15
CVC size	7 Fr	Ramp waveform	Decelerating
CVC depth	85 to 105mm	Volume Control	16kg 18kg
Airtraq™	Size 1 (Purple)	Tidal volume (mL)	96 108
		Minute volume (L)	2.88 3.24
		Pressure Control	16kg 18kg
		PIP (cmH ₂ O)	20

Chart 5.65

Child			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	16kg	18kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	13	14
Amikacin 25mg/kg loading dose	500mg/10mL (50mg/mL)	8	9
Amoxicillin 30mg/kg/dose tds	500mg/10mL (50mg/mL)	10	10
Amoxy-clav 32mg/kg/dose tds	600mg/10mL (60mg/mL)	9	10
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	4	4.5
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	4	4
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	16	18
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	13	14
Cefepime 50mg/kg/dose bd	1g/20mL (50mg/mL)	16	18
Ceftriaxone 100mg/kg/dose bd	2g/20mL (100mg/mL)	16	18
Cefuroxime 40mg/kg/dose tds	750mg/20mL (37.5mg/mL)	17	19
Ciprofloxacin 10mg/kg/dose tds	200mg/100mL (2mg/mL)	80	90
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	16	18
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	16	18
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	3	4
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	8	9
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	48	54
Gentamicin 8mg/kg loading dose	160mg/20mL (8mg/mL)	16	18
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	32	36
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	80	90
Meropenem 40mg/kg/dose tds	1g/20mL (50mg/mL)	13	14
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	24	27
Penicillin G 100kU/kg/dose qid	2MU/20mL (100KU/mL)	16	18
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	20	23
Quinine 20mg/kg/dose loading dose	600mg/100mL D5W (6mg/mL)	53	60
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	16	18
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	32	36

Chart 5.66

16kg	16kg	16kg	16kg	16kg	16kg
Medication		Syringe (mL)	Preparation		mL
Adenosine 1 st dose 0.1mg/kg		10	6mg/2mL + 4mL dil. (1mg/mL)		1.6
Adenosine next doses 0.2mg/kg		10	6mg/2mL + 4mL dil. (1mg/mL)		3.2
Adrenaline IM		1	1:1000 solution undiluted (1mg/mL)		0.2
Adrenaline IV/IO 0.01mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		1.6
Amiodarone 5mg/kg		10	150mg/3mL + 7mL dil. (15mg/mL)		6
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		3
Atropine for OP poisoning 0.05mg/kg		10	1mg/2mL + 8mL dil. (0.1mg/mL)		8
Biperiden 0.1mg/kg		10	5mg/1mL + 9mL dil. (0.5mg/mL)		3
Blood bolus 10mL/kg		Adjust dose to indication; warm before use			160
Blood packed cells transfusion		mL to ↑ Hb by 1g/dL			91
Calcium chloride 20mg/kg		10	1g/10mL undiluted (100mg/mL)		3
Calcium gluconate 60mg/kg		10	1g/10mL undiluted (100mg/mL)		10
Chlorpheniramine 0.1mg/kg		10	10mg/1mL + 9mL dil. (1mg/mL)		1.6
Clonazepam 0.02mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		3
Cryoprecipitate 3mL/kg		Adjust dose to indication; warm before use			48
Cardioversion 1J/kg		Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.			16
Defibrillation 4J/kg					64
Dantrolene 1mg/kg		60	20mg in 60mL dil. (0.33mg/mL)		48
Desmopressin 0.3µg/kg		10	8µg/2mL + 8mL dil. (0.8µg/mL)		6
Dexamethasone 0.6mg/kg		5	4mg/2mL undiluted (2mg/mL)		4.5
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)		0.6
Diazepam PR 0.5mg/kg		5	10mg/2mL undiluted (5mg/mL)		1.5
Digoxin 15µg/kg first dose		10	0.5mg/2mL + 8mL dil. (50µg/mL)		5
Diphenhydramine 1mg/kg		10	50mg/1mL + 9mL dil. (5mg/mL)		3
Ephedrine 0.3mg/kg		20	50mg/1mL + 19mL dil. (2.5mg/mL)		2
Etomidate 0.3mg/kg		20	20mg/10mL + 10mL dil. (1mg/mL)		5
Factor VIII concentrate			500IU/10mL give slowly IV		16
Factor IX concentrate			500IU/10mL give slowly IV		30

Chart 5.67

16kg	16kg	16kg	16kg	16kg	16kg
Medication		Syringe (mL)	Preparation		mL
Fentanyl 1µg/kg		10	100µg/2mL + 8mL dil. (10µg/mL)		1.5
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use			320
Flumazenil 0.01mg/kg		10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		3
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		13
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use			240
Furosemide 0.5mg/kg		10	20mg/2mL + 8mL dil. (2mg/mL)		4
Glucagon 0.05mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		8
Glucose (D25W) 0.5g/kg		50	25mL D50W + 25mL dil. (0.25g/mL)		32
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		8
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)		6
Insulin (soluble) 0.1U/kg		1	10U/0.1mL undiluted		0.15
Ketamine IV/IO 2mg/kg		5	10mg/mL undiluted		3
Ketamine IM 4mg/kg		5	50mg/mL undiluted		1.3
Ketofol 0.75mg/kg ketamine and propofol		5	mL of propofol 1% + ketamine 1%		1.2
Ketorolac 0.5mg/kg		10	10mg/1mL + 9mL dil. (1mg/mL)		8
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.6
Lidocaine 1mg/kg		10	100mg/5mL + 5mL dil. (10mg/mL)		2
Lorazepam 0.1mg/kg		10	4mg/1mL + 7mL dil. (0.5mg/mL)		3
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)		6.5
Maintenance fluids mL/hr					52
Mannitol 1g/kg			25g/100mL undiluted (0.25g/mL)		64
Methylene blue 1mg/kg		10	100mg/10mL undiluted (10mg/mL)		1.6
Methylprednisolone 2mg/kg		10	40mg/1mL + 9mL dil. (4mg/mL)		8
Midazolam IV/IO 0.1mg/kg		5	5mg/5mL undiluted (1mg/mL)		1.6
Midazolam IM 0.2mg/kg		1	5	15mg/3mL undiluted (5mg/mL)	0.6
Morphine 0.05mg/kg		1	10	10mg/1mL + 9mL dil. (1mg/mL)	0.8
N-acetylcysteine IV 150mg/kg		50	4g/20mL + 30mL dil. (80mg/mL)		30
N-acetylcysteine PO 140mg/kg			400mg sachets		5½

Chart 5.68

16kg	16kg	16kg	16kg	16kg	16kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	4		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	2.5		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	5		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	6		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	4		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	7		
Paracetamol 15mg/kg	10	10mg/mL undiluted	24		
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	8		
Phenytoin 20mg/kg	50	500mg/10mL + 40mL dil. (10mg/mL)	32		
Platelets 10mL/kg	Adjust dose to indication; warm before use				160
Potassium IV/IO for severe hypokalaemia	10	KCl 15% (2mmol/mL) - give SLOWLY	6		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	8		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	2.5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	3		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	5		
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	8		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	3		
Rehydration – mild dehydration	mL/hr for 24hours				85
Rehydration – moderate dehydration	mL/hr for 24hours				120
Rehydration – severe dehydration	mL/hr for 24hours				150
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	3		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	5		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	16		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				62
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	3		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	4		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	3		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				6

Chart 5.69

16kg	16kg	16kg	16kg	16kg	16kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	8		
Toxic dose: lidocaine 1% + adrenaline			11		
Toxic dose: bupivacaine 0.5%			9		
Toxic dose: ropivacaine 0.75%			8		
Toxic dose: prilocaine 1%			12		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	5		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	8		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	16		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	4		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	4		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	8		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.48		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	2.2		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	6.4		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	16		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	1		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	1.2		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	1.6		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	1.9		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	0.96		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.48		
Propofol 1% solution undiluted	50	1mg/kg/hr	1.6		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	1.2		

Chart 5.70

18kg	18kg	18kg	18kg	18kg	18kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	1.8		
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	3.6		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.2		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2		
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	6		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	3.5		
Atropine for OP poisoning 0.05mg/kg	10	1mg/2mL + 8mL dil. (0.1mg/mL)	9		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	3.5		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				180
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				102
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	3.5		
Calcium gluconate 60mg/kg	20	2g/20mL undiluted (100mg/mL)	11		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	1.8		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3.5		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				54
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				18
Defibrillation 4J/kg					72
Dantrolene 1mg/kg	60	20mg in 60mL dil. (0.33mg/mL)	54		
Desmopressin 0.3µg/kg	10	8µg/2mL + 8mL dil. (0.8µg/mL)	7		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	5		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.7		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.5mg/2mL + 8mL dil. (50µg/mL)	6		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	3.5		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	2		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	6		
Factor VIII concentrate	500IU/10mL give slowly IV				18
Factor IX concentrate	500IU/10mL give slowly IV				32

Chart 5.71

18kg	18kg	18kg	18kg	18kg	18kg
Medication		Syringe (mL)	Preparation		mL
Fentanyl 1µg/kg		10	100µg/2mL + 8mL dil. (10µg/mL)		2
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use			360
Flumazenil 0.01mg/kg		10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		3.5
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		14
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use			270
Furosemide 0.5mg/kg		10	20mg/2mL + 8mL dil. (2mg/mL)		4.5
Glucagon 0.05mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		9
Glucose (D25W) 0.5g/kg		50	25mL D50W + 25mL dil. (0.25g/mL)		36
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		9
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)		7
Insulin (soluble) 0.1U/kg		1	10U/0.1mL undiluted		0.2
Ketamine IV/IO 2mg/kg		5	10mg/mL undiluted		3.5
Ketamine IM 4mg/kg		5	50mg/mL undiluted		1.4
Ketofol 0.75mg/kg ketamine and propofol		5	mL of propofol 1% + ketamine 1%		1.4
Ketorolac 0.5mg/kg		10	10mg/1mL + 9mL dil. (1mg/mL)		9
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.7
Lidocaine 1mg/kg		10	100mg/5mL + 5mL dil. (10mg/mL)		2
Lorazepam 0.1mg/kg		10	4mg/1mL + 7mL dil. (0.5mg/mL)		3.5
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)		7
Maintenance fluids mL/hr					56
Mannitol 1g/kg			25g/100mL undiluted (0.25g/mL)		72
Methylene blue 1mg/kg		10	100mg/10mL undiluted (10mg/mL)		2
Methylprednisolone 2mg/kg		10	40mg/1mL + 9mL dil. (4mg/mL)		9
Midazolam IV/IO 0.1mg/kg		5	5mg/5mL undiluted (1mg/mL)		2
Midazolam IM 0.2mg/kg		1	5	15mg/3mL undiluted (5mg/mL)	0.7
Morphine 0.05mg/kg		1	10	10mg/1mL + 9mL dil. (1mg/mL)	0.9
N-acetylcysteine IV 150mg/kg		50	4g/20mL + 30mL dil. (80mg/mL)		34
N-acetylcysteine PO 140mg/kg			400mg sachets		6

Chart 5.72

18kg	18kg	18kg	18kg	18kg	18kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	4.5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	3		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	6		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	7		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	5		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	8		
Paracetamol 15mg/kg	10	10mg/mL undiluted	27		
Phenobarbitone 10mg/kg	10	200mg/1mL + 9mL dil. (20mg/mL)	9		
Phenytoin 20mg/kg	50	500mg/10mL + 40mL dil. (10mg/mL)	36		
Platelets 10mL/kg	Adjust dose to indication; warm before use				180
Potassium IV/IO for severe hypokalaemia	10	KCl 15% (2mmol/mL) - give SLOWLY	7		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	9		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	2.5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	3.5		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	6		
Pyridostigmine 0.05mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	9		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	3.5		
Rehydration – mild dehydration	mL/hr for 24hours				95
Rehydration – moderate dehydration	mL/hr for 24hours				130
Rehydration – severe dehydration	mL/hr for 24hours				170
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	4		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	5.5		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	18		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				70
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	4		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	4		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	3		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				7

Chart 5.73

18kg	18kg	18kg	18kg	18kg	18kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	9		
Toxic dose: lidocaine 1% + adrenaline			13		
Toxic dose: bupivacaine 0.5%			11		
Toxic dose: ropivacaine 0.75%			9		
Toxic dose: prilocaine 1%			14		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	6		
Tranexamic acid 25mg/kg	10	500mg/5mL + 5mL dil. (50mg/mL)	9		
Valproate 20mg/kg	20	400mg/4mL + 16mL dil. (20mg/mL)	18		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	5		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	5		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	9		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.54		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	2.5		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	7.2		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	18		
Dobutamine 250mg/20mL + 30mL dil.	50	5µg/kg/min	1.1		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	1.4		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	1.8		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	2.2		
Nitroglycerin 25mg/5mL + 45mL dil.	50	0.5µg/kg/min	1.1		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.54		
Propofol 1% solution undiluted	50	1mg/kg/hr	1.8		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	1.4		

Chart 5.74

Child		20kg 22kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	2	Average BP (mmHg)	95/58
ETT size cuffed	5.0mm	Maximum SBP (mmHg)	115
ETT size uncuffed	-	Minimum SBP (mmHg)	82
ETT depth	16.5cm	Heart rate (per min)	91 (66, 117)
Introducer	14 Fr (4.7mm)	Respiratory rate (per min)	21 (17, 25)
Bougie	12 Fr (4mm)	Urine output (mL/hour)	30 to 33r
Oropharyngeal airway	70mm / Size 2	Peak expiratory flow (L/min)	180
Nasopharyngeal airway	6 x 105mm	Body surface area (m ²)	0.78
Bag-valve resuscitator	Adult	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 3 to 4		
Suction catheter	10 Fr		
Heat-moisture exchanger	± 12mL		
Intercostal drain size	24 to 30 Fr	F _I O ₂	100%
Urethral catheter	10 to 12 Fr	Respiratory rate (per min)	30
Intraosseous needle size	18G to 15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	10 to 15mm	I:E ratio	1:2
Nasogastric tube size	12 to 14 Fr	Inspiratory time (s)	0.67 (33%)
IV access	18 to 22G	PS / ASB (cmH ₂ O)	10
BP cuff	Child	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 2 to 2.5	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 2	Peak flow (L/min)	>20
CVC size	7 Fr	Ramp waveform	Decelerating
CVC depth	95 to 115mm	Volume Control	20kg 22kg
Airtraq™	Size 1 (Purple)	Tidal volume (mL)	120 132
		Minute volume (L)	3.6 3.96
		Pressure Control	20kg 22kg
		PIP (cmH ₂ O)	20

Chart 5.75

Child			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	20kg	22kg
Aciclovir 10mg/kg/dose tds	250mg/20mL (12.5mg/mL)	16	18
Amikacin 25mg/kg loading dose	750mg/15mL (50mg/mL)	10	11
Amoxicillin 30mg/kg/dose tds	1g/20mL (50mg/mL)	12	13
Amoxy-clav 32mg/kg/dose tds	1.2g/20mL (60mg/mL)	11	12
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	5	5.5
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	5	5.5
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	20	22
Cefazolin 20mg/kg/dose tds	500mg/20mL (25mg/mL)	16	18
Cefepime 50mg/kg/dose bd	1g/20mL (50mg/mL)	20	20
Ceftriaxone 100mg/kg/dose bd	2g/20mL (100mg/mL)	20	20
Cefuroxime 40mg/kg/dose tds	1.5g/20mL (75mg/mL)	11	12
Ciprofloxacin 10mg/kg/dose tds	200mg/100mL (2mg/mL)	100	100
Clindamycin 20mg/kg/dose tds	400mg/20mL (20mg/mL)	20	20
Cloxacillin 25mg/kg/dose qid	500mg/20mL (25mg/mL)	20	20
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	4	4
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	10	11
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	60	66
Gentamicin 8mg/kg loading dose	160mg/20mL (8mg/mL)	20	20
Levofloxacin 10mg/kg/dose od	250mg/50mL (5mg/mL)	40	44
Linezolid 10mg/kg/dose tds	200mg/100mL (2mg/mL)	100	100
Meropenem 40mg/kg/dose tds	1g/20mL (50mg/mL)	16	18
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	30	33
Penicillin G 100kU/kg/dose qid	2MU/20mL (100kU/mL)	20	20
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	25	28
Quinine 20mg/kg/dose loading dose	600mg/100mL D5W (6mg/mL)	67	73
Teicoplanin 10mg/kg/dose bd	200mg/20mL (10mg/mL)	20	20
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	40	44

Chart 5.76

20kg	20kg	20kg	20kg	20kg	20kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	2		
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	4		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.3		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2		
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	7		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	4		
Atropine for OP poisoning 0.05mg/kg	10	2mg/4mL + 6mL dil. (0.2mg/mL)	5		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	4		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				200
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				114
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	4		
Calcium gluconate 60mg/kg	20	2g/20mL undiluted (100mg/mL)	12		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				60
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				20
Defibrillation 4J/kg					80
Dantrolene 1mg/kg	40mg in 120mL dil. (0.33mg/mL)				60
Desmopressin 0.3µg/kg	10	8µg/2mL + 8mL dil. (0.8µg/mL)	8		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	6		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.8		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.5mg/2mL + 8mL dil. (50µg/mL)	6		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	4		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	2		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	6		
Factor VIII concentrate	500IU/10mL give slowly IV				20
Factor IX concentrate	500IU/10mL give slowly IV				36

Chart 5.77

20kg	20kg	20kg	20kg	20kg	20kg
Medication		Syringe (mL)	Preparation		mL
Fentanyl 1µg/kg		10	100µg/2mL + 8mL dil. (10µg/mL)		2
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use			400
Flumazenil 0.01mg/kg		10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		4
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		16
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use			300
Furosemide 0.5mg/kg		10	20mg/2mL + 8mL dil. (2mg/mL)		5
Glucagon 0.05mg/kg		10	2mg/2mL + 8mL dil. (0.2mg/mL)		5
Glucose (D25W) 0.5g/kg		50	25mL D50W + 25mL dil. (0.25g/mL)		40
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		10
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)		8
Insulin (soluble) 0.1U/kg		1	10U/0.1mL undiluted		0.2
Ketamine IV/IO 2mg/kg		5	10mg/mL undiluted		4
Ketamine IM 4mg/kg		5	50mg/mL undiluted		2
Ketofol 0.75mg/kg ketamine and propofol		5	mL of propofol 1% + ketamine 1%		1.5
Ketorolac 0.5mg/kg		10	30mg/1mL + 9mL dil. (3mg/mL)		3
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.8
Lidocaine 1mg/kg		10	100mg/5mL + 5mL dil. (10mg/mL)		2
Lorazepam 0.1mg/kg		10	4mg/1mL + 7mL dil. (0.5mg/mL)		4
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)		8
Maintenance fluids mL/hr					60
Mannitol 1g/kg			25g/100mL undiluted (0.25g/mL)		80
Methylene blue 1mg/kg		10	100mg/10mL undiluted (10mg/mL)		2
Methylprednisolone 2mg/kg		10	125mg/1mL + 9mL dil. (12.5mg/mL)		3
Midazolam IV/IO 0.1mg/kg		5	5mg/5mL undiluted (1mg/mL)		2
Midazolam IM 0.2mg/kg		1	5	15mg/3mL undiluted (5mg/mL)	0.8
Morphine 0.05mg/kg		1	10	10mg/1mL + 9mL dil. (1mg/mL)	1
N-acetylcysteine IV 150mg/kg		50	4g/20mL + 30mL dil. (80mg/mL)		38
N-acetylcysteine PO 140mg/kg			400mg sachets		7

Chart 5.78

20kg	20kg	20kg	20kg	20kg	20kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	3		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	6		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	8		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	5		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	9		
Paracetamol 15mg/kg	10	10mg/mL undiluted	30		
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)	5		
Phenytoin 20mg/kg	50	500mg/10mL + 40mL dil. (10mg/mL)	40		
Platelets 10mL/kg	Adjust dose to indication; warm before use				200
Potassium IV/IO for severe hypokalaemia	10	KCl 15% (2mmol/mL) - give SLOWLY	8		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	10		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	3		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	4		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	6		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	5		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	4		
Rehydration – mild dehydration	mL/hr for 24hours				85
Rehydration – moderate dehydration	mL/hr for 24hours				110
Rehydration – severe dehydration	mL/hr for 24hours				135
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	4		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	6		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	20		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				77
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	4		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	5		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	3		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				8

Chart 5.79

20kg	20kg	20kg	20kg	20kg	20kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	10		
Toxic dose: lidocaine 1% + adrenaline			14		
Toxic dose: bupivacaine 0.5%			12		
Toxic dose: ropivacaine 0.75%			10		
Toxic dose: prilocaine 1%			16		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	6		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	10		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	10		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	5		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	5		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.6		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	2.8		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	8		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	20		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	0.6		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	1.5		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	2		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	2.4		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	0.6		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.6		
Propofol 1% solution undiluted	50	1mg/kg/hr	2		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	1.5		

Chart 5.80

22kg	22kg	22kg	22kg	22kg	22kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	2		
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	4.5		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.3		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	2		
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	7		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	4		
Atropine for OP poisoning 0.05mg/kg	10	2mg/4mL + 6mL dil. (0.2mg/mL)	5.5		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	4		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				220
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				125
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	4		
Calcium gluconate 60mg/kg	20	2g/20mL undiluted (100mg/mL)	13		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				66
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				22
Defibrillation 4J/kg					88
Dantrolene 1mg/kg	40mg in 120mL dil. (0.33mg/mL)				66
Desmopressin 0.3µg/kg	10	8µg/2mL + 8mL dil. (0.8µg/mL)	8		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	6.5		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	0.9		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.5mg/2mL + 8mL dil. (50µg/mL)	7		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	4.5		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	2		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	7		
Factor VIII concentrate	500IU/10mL give slowly IV				22
Factor IX concentrate	500IU/10mL give slowly IV				40

Chart 5.81

22kg	22kg	22kg	22kg	22kg	22kg
Medication		Syringe (mL)	Preparation		mL
Fentanyl 1µg/kg		10	100µg/2mL + 8mL dil. (10µg/mL)		2
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use			440
Flumazenil 0.01mg/kg		10	0.5mg/5mL + 5mL dil. (0.05mg/mL)		4
Fosphenytoin 20mg/kg		20	500mg/10mL + 10mL dil. (25mg/mL)		18
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use			330
Furosemide 0.5mg/kg		10	20mg/2mL + 8mL dil. (2mg/mL)		6
Glucagon 0.05mg/kg		10	2mg/2mL + 8mL dil. (0.2mg/mL)		8
Glucose (D25W) 0.5g/kg		50	25mL D50W + 25mL dil. (0.25g/mL)		44
Glycopyrrolate 0.01mg/kg		10	0.2mg/1mL + 9mL dil. (0.02mg/mL)		10
Hydrocortisone 4mg/kg		10	100mg/2mL + 8mL dil. (10mg/mL)		9
Insulin (soluble) 0.1U/kg		1	10U/0.1mL undiluted		0.2
Ketamine IV/IO 2mg/kg		5	10mg/mL undiluted		4
Ketamine IM 4mg/kg		5	50mg/mL undiluted		2
Ketofol 0.75mg/kg ketamine and propofol		5	mL of propofol 1% + ketamine 1%		1.5
Ketorolac 0.5mg/kg		10	30mg/1mL + 9mL dil. (3mg/mL)		4
Labetalol 0.2mg/kg		1	5mg/mL undiluted		0.9
Lidocaine 1mg/kg		10	100mg/5mL + 5mL dil. (10mg/mL)		2
Lorazepam 0.1mg/kg		10	4mg/1mL + 7mL dil. (0.5mg/mL)		4
Magnesium sulphate 40mg/kg		10	1g/2mL + 8mL dil. (100mg/mL)		9
Maintenance fluids mL/hr					62
Mannitol 1g/kg			25g/100mL undiluted (0.25g/mL)		88
Methylene blue 1mg/kg		10	100mg/10mL undiluted (10mg/mL)		2
Methylprednisolone 2mg/kg		10	125mg/1mL + 9mL dil. (12.5mg/mL)		3.5
Midazolam IV/IO 0.1mg/kg		5	5mg/5mL undiluted (1mg/mL)		2
Midazolam IM 0.2mg/kg		1	5	15mg/3mL undiluted (5mg/mL)	0.9
Morphine 0.05mg/kg		1	10	10mg/1mL + 9mL dil. (1mg/mL)	1
N-acetylcysteine IV 150mg/kg		50	4g/20mL + 30mL dil. (80mg/mL)		41
N-acetylcysteine PO 140mg/kg			400mg sachets		7½

Chart 5.82

22kg	22kg	22kg	22kg	22kg	22kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	3.5		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	7		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	8		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	6		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	10		
Paracetamol 15mg/kg	10	10mg/mL undiluted	33		
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)	6		
Phenytoin 20mg/kg	50	500mg/10mL + 40mL dil. (10mg/mL)	44		
Platelets 10mL/kg	Adjust dose to indication; warm before use				220
Potassium IV/IO for severe hypokalaemia	10	KCl 15% (2mmol/mL) - give SLOWLY	8		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	11		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	3.5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	4		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	7		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	5.5		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	4		
Rehydration – mild dehydration	mL/hr for 24hours				90
Rehydration – moderate dehydration	mL/hr for 24hours				120
Rehydration – severe dehydration	mL/hr for 24hours				145
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	4		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	7		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	22		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				85
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	4.5		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	5		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	4		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				9

Chart 5.83

22kg	22kg	22kg	22kg	22kg	22kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	11		
Toxic dose: lidocaine 1% + adrenaline			15		
Toxic dose: bupivacaine 0.5%			13		
Toxic dose: ropivacaine 0.75%			11		
Toxic dose: prilocaine 1%			17		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	7		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	11		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	11		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	6		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	6		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.66		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	3.1		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	8.8		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	22		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	0.66		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	1.7		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	2.2		
Lidocaine 500mg/5mL + 45mL dil.	50	20µg/kg/min	2.6		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	0.66		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.66		
Propofol 1% solution undiluted	50	1mg/kg/hr	2.2		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	1.65		

Chart 5.84

Large Child		24kg 28kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	2	Average BP (mmHg)	100/62
ETT size cuffed	6.0	Maximum SBP (mmHg)	122
ETT size uncuffed	-	Minimum SBP (mmHg)	86
ETT depth	17 to 18cm	Heart rate (per min)	84 (59, 109)
Introducer	14 Fr (4.7mm)	Respiratory rate (per min)	19 (15, 24)
Bougie	12 Fr (4mm)	Urine output (mL/hour)	36 to 45
Oropharyngeal airway	80mm / Size 3	Peak expiratory flow (L/min)	245
Nasopharyngeal airway	6 x 110mm	Body surface area (m ²)	0.99
Bag-valve resuscitator	Adult	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 3 to 4		
Suction catheter	10 Fr		
Heat-moisture exchanger	± 12mL		
Intercostal drain size	28 to 32 Fr	F _I O ₂	100%
Urethral catheter	12 Fr	Respiratory rate (per min)	20
Intraosseous needle size	15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	15mm	I:E ratio	1:2
Nasogastric tube size	14 to 18 Fr	Inspiratory time (s)	1 (33%)
IV access	18 to 20G	PS / ASB (cmH ₂ O)	10
BP cuff	Child	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 2.5	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 2.5	Peak flow (L/min)	>20
CVC size	7 to 8 Fr	Ramp waveform	Decelerating
CVC depth	110 to 130mm	Volume Control	24kg 28kg
Airtraq™	Size 2 (Green)	Tidal volume (mL)	144 168
		Minute volume (L)	2.88 3.36
		Pressure Control	24kg 28kg
		PIP (cmH ₂ O)	20

Chart 5.85

Large Child			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	24kg	28kg
Aciclovir 10mg/kg/dose tds	500mg/20mL (25mg/mL)	10	11
Amikacin 25mg/kg loading dose	750mg/15mL (50mg/mL)	12	14
Amoxicillin 30mg/kg/dose tds	1g/20mL (50mg/mL)	14	17
Amoxy-clav 32mg/kg/dose tds	1.2g/20mL (60mg/mL)	13	15
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	6	7
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	6	6
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	24	28
Cefazolin 20mg/kg/dose tds	1g/20mL (50mg/mL)	10	11
Cefepime 50mg/kg/dose bd	2g/20mL (100mg/mL)	12	14
Ceftriaxone 100mg/kg/dose bd	2g/20mL (100mg/mL)	20	20
Cefuroxime 40mg/kg/dose tds	1.5g/20mL (75mg/mL)	12	14
Ciprofloxacin 10mg/kg/dose tds	400mg/200mL (2mg/mL)	120	140
Clindamycin 20mg/kg/dose tds	800mg/20mL (40mg/mL)	12	14
Cloxacillin 25mg/kg/dose qid	1g/20mL (50mg/mL)	12	14
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	5	6
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	12	14
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	72	84
Gentamicin 8mg/kg loading dose	240mg/20mL (12mg/mL)	16	19
Levofloxacin 10mg/kg/dose od	500mg/100mL (5mg/mL)	48	56
Linezolid 10mg/kg/dose tds	400mg/200mL (2mg/mL)	120	140
Meropenem 40mg/kg/dose tds	1g/20mL (50mg/mL)	19	20
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	36	42
Penicillin G 100kU/kg/dose qid	3MU/20mL (150KU/mL)	16	19
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	30	35
Quinine 20mg/kg/dose loading dose	600mg/100mL D5W (6mg/mL)	80	93
Teicoplanin 10mg/kg/dose bd	400mg/20mL (20mg/mL)	12	14
Vancomycin 20mg/kg/dose bd	500mg/50mL (10mg/mL)	48	50

Chart 5.86

24kg	24kg	24kg	24kg	24kg	24kg
Medication		Syringe (mL)	Preparation		mL
Adenosine 1 st dose 0.1mg/kg		10	6mg/2mL + 4mL dil. (1mg/mL)		2.5
Adenosine next doses 0.2mg/kg		10	6mg/2mL + 4mL dil. (1mg/mL)		5
Adrenaline IM		1	1:1000 solution undiluted (1mg/mL)		0.3
Adrenaline IV/IO 0.01mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		3
Amiodarone 5mg/kg		10	150mg/3mL + 7mL dil. (15mg/mL)		8
Atropine 0.02mg/kg		5	0.5mg/1mL + 4mL dil. (0.1mg/mL)		5
Atropine for OP poisoning 0.05mg/kg		10	2mg/4mL + 6mL dil. (0.2mg/mL)		6
Biperiden 0.1mg/kg		10	5mg/1mL + 9mL dil. (0.5mg/mL)		5
Blood bolus 10mL/kg		Adjust dose to indication; warm before use			240
Blood packed cells transfusion		mL to ↑ Hb by 1g/dL			137
Calcium chloride 20mg/kg		10	1g/10mL undiluted (100mg/mL)		5
Calcium gluconate 60mg/kg		20	2g/20mL undiluted (100mg/mL)		14
Chlorpheniramine 0.1mg/kg		10	10mg/1mL + 9mL dil. (1mg/mL)		2.5
Clonazepam 0.02mg/kg		10	1mg/1mL + 9mL dil. (0.1mg/mL)		5
Cryoprecipitate 3mL/kg		Adjust dose to indication; warm before use			72
Cardioversion 1J/kg		Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.			24
Defibrillation 4J/kg					96
Dantrolene 1mg/kg		40mg in 120mL dil. (0.33mg/mL)			72
Desmopressin 0.3µg/kg		10	12µg/3mL + 7mL dil. (1.2µg/mL)		6
Dexamethasone 0.6mg/kg		5	4mg/2mL undiluted (2mg/mL)		7
Diazepam IV/IO 0.2mg/kg		1	10mg/2mL undiluted (5mg/mL)		1
Diazepam PR 0.5mg/kg		5	10mg/2mL undiluted (5mg/mL)		2
Digoxin 15µg/kg first dose		10	0.5mg/2mL + 8mL dil. (50µg/mL)		7
Diphenhydramine 1mg/kg		10	50mg/1mL + 9mL dil. (5mg/mL)		5
Ephedrine 0.3mg/kg		20	50mg/1mL + 19mL dil. (2.5mg/mL)		3
Etomidate 0.3mg/kg		20	20mg/10mL + 10mL dil. (1mg/mL)		7
Factor VIII concentrate		500IU/10mL give slowly IV			24
Factor IX concentrate		500IU/10mL give slowly IV			44

Chart 5.87

24kg	24kg	24kg	24kg	24kg	24kg
Medication		Syringe (mL)	Preparation		mL
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)			2.5
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use				480
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)			5
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)			20
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use				360
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)			6
Glucagon 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)			6
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)			48
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)			10
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)			10
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted			0.25
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted			5
Ketamine IM 4mg/kg	5	50mg/mL undiluted			2
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%			2
Ketorolac 0.5mg/kg	10	30mg/1mL + 9mL dil. (3mg/mL)			4
Labetalol 0.2mg/kg	1	5mg/mL undiluted			1
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)			2.5
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)			5
Magnesium sulphate 40mg/kg	10	1g/2mL + 8mL dil. (100mg/mL)			10
Maintenance fluids mL/hr					64
Mannitol 1g/kg			25g/100mL undiluted (0.25g/mL)		96
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)			2.5
Methylprednisolone 2mg/kg	10	125mg/1mL + 9mL dil. (12.5mg/mL)			4
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)			2.5
Midazolam IM 0.2mg/kg	1	5	15mg/3mL undiluted (5mg/mL)	1	
Morphine 0.05mg/kg	1	10	10mg/1mL + 9mL dil. (1mg/mL)	1	
N-acetylcysteine IV 150mg/kg	50	4g/20mL + 30mL dil. (80mg/mL)			45
N-acetylcysteine PO 140mg/kg			400mg sachets		8½

Chart 5.88

24kg	24kg	24kg	24kg	24kg	24kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	4		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	8		
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	9		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	6		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	10		
Paracetamol 15mg/kg	10	10mg/mL undiluted	36		
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)	6		
Phenytoin 20mg/kg	50	500mg/10mL + 40mL dil. (10mg/mL)	50		
Platelets 10mL/kg	Adjust dose to indication; warm before use				240
Potassium IV/IO for severe hypokalaemia	10	KCl 15% (2mmol/mL) - give SLOWLY	9		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	12		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	3.5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	5		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	7		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	6		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	5		
Rehydration – mild dehydration	mL/hr for 24hours				95
Rehydration – moderate dehydration	mL/hr for 24hours				125
Rehydration – severe dehydration	mL/hr for 24hours				155
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	5		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	7		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	24		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				93
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	5		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	6		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	4		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				10

Chart 5.89

24kg	24kg	24kg	24kg	24kg	24kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	12		
Toxic dose: lidocaine 1% + adrenaline			17		
Toxic dose: bupivacaine 0.5%			14		
Toxic dose: ropivacaine 0.75%			12		
Toxic dose: prilocaine 1%			19		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	7		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	12		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	12		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	6		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	6		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.72		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	3.4		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	9.6		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	24		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	0.72		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	1.8		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	2.4		
Lidocaine 1g/10mL + 40mL dil.	50	20µg/kg/min	1.4		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	0.72		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.72		
Propofol 1% solution undiluted	50	1mg/kg/hr	2.4		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	1.8		

Chart 5.90

28kg	28kg	28kg	28kg	28kg	28kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	3		
Adenosine next doses 0.2mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	6		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.3		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3		
Amiodarone 5mg/kg	10	150mg/3mL + 7mL dil. (15mg/mL)	9		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5		
Atropine for OP poisoning 0.05mg/kg	10	2mg/4mL + 6mL dil. (0.2mg/mL)	7		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	6		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				280
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				160
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	6		
Calcium gluconate 60mg/kg	20	2g/20mL undiluted (100mg/mL)	17		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	3		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	6		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				84
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				28
Defibrillation 4J/kg					112
Dantrolene 1mg/kg	40mg in 120mL dil. (0.33mg/mL)				84
Desmopressin 0.3µg/kg	10	12µg/3mL + 7mL dil. (1.2µg/mL)	7		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	8		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	1		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.5mg/2mL + 8mL dil. (50µg/mL)	8		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	5.5		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	3.5		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	8		
Factor VIII concentrate	500IU/10mL give slowly IV				28
Factor IX concentrate	500IU/10mL give slowly IV				50

Chart 5.91

28kg	28kg	28kg	28kg	28kg	28kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)	3		
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use			560	
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	6		
Fosphenytoin 20mg/kg	20	500mg/10mL + 10mL dil. (25mg/mL)	20		
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use			420	
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	7		
Glucagon 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	7		
Glucose (D25W) 0.5g/kg		50mL D50W + 50mL dil. (0.25g/mL)	56		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	10		
Hydrocortisone 4mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	10		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.3		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	6		
Ketamine IM 4mg/kg	5	50mg/mL undiluted	2.5		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	2		
Ketorolac 0.5mg/kg	10	30mg/1mL + 9mL dil. (3mg/mL)	5		
Labetalol 0.2mg/kg	1	5mg/mL undiluted	1		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	3		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	6		
Magnesium sulphate 40mg/kg	10	2g/4mL + 6mL dil. (200mg/mL)	6		
Maintenance fluids mL/hr			68		
Mannitol 1g/kg		25g/100mL undiluted (0.25g/mL)	112		
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	3		
Methylprednisolone 2mg/kg	10	125mg/1mL + 9mL dil. (12.5mg/mL)	4.5		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	3		
Midazolam IM 0.2mg/kg	1	5	15mg/3mL undiluted (5mg/mL)	1	
Morphine 0.05mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2		
N-acetylcysteine IV 150mg/kg	50	6g/30mL + 20mL dil. (80mg/mL)	35		
N-acetylcysteine PO 140mg/kg		400mg sachets	10		

Chart 5.92

28kg	28kg	28kg	28kg	28kg	28kg
Medication		Syringe (mL)	Preparation		mL
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted			5
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)			4.5
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)			9
Ondansetron 0.15mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)			10
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)			7
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)			10
Paracetamol 15mg/kg	10	10mg/mL undiluted			42
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)			7
Phenytoin 20mg/kg	50	750mg/15mL + 35mL dil. (15mg/mL)			37
Platelets 10mL/kg		Adjust dose to indication; warm before use			280
Potassium IV/IO for severe hypokalaemia	20	KCl 15% (2mmol/mL) - give SLOWLY			11
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)			14
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)			4
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)			6
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)			8
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)			7
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)			6
Rehydration – mild dehydration		mL/hr for 24hours			105
Rehydration – moderate dehydration		mL/hr for 24hours			140
Rehydration – severe dehydration		mL/hr for 24hours			175
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)			6
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)			8
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving			28
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L			109
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)			6
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)			6
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)			4.5
Tilidine PO 1mg/kg		drops of 2.5mg/drop solution			11

Chart 5.93

28kg	28kg	28kg	28kg	28kg	28kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	14		
Toxic dose: lidocaine 1% + adrenaline			20		
Toxic dose: bupivacaine 0.5%			17		
Toxic dose: ropivacaine 0.75%			15		
Toxic dose: prilocaine 1%			22		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	8		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	14		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	14		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	8		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	7		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.84		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	3.9		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	11		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	28		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	0.84		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	2.1		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	2.8		
Lidocaine 1g/10mL + 40mL dil.	50	20µg/kg/min	1.7		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	0.84		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.84		
Propofol 1% solution undiluted	50	1mg/kg/hr	2.8		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	2.1		

Chart 5.94

Young Adolescent		32kg 36kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	3	Average BP (mmHg)	110/65
ETT size cuffed	6.5mm	Maximum SBP (mmHg)	128
ETT size uncuffed	-	Minimum SBP (mmHg)	92
ETT depth	18.5 to 19.5cm	Heart rate (per min)	78 (54, 102)
Introducer	14 Fr (4.7mm)	Respiratory rate (per min)	18 (14, 22)
Bougie	14 Fr (4.7mm)	Urine output (mL/hour)	48 to 54
Oropharyngeal airway	80mm / Size 3	Peak expiratory flow (L/min)	290
Nasopharyngeal airway	6.6 x 115mm	Body surface area (m ²)	1.16
Bag-valve resuscitator	Adult	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 3 to 5		
Suction catheter	10 to 12 Fr		
Heat-moisture exchanger	± 25mL		
Intercostal drain size	28 to 36 Fr	F _I O ₂	100%
Urethral catheter	12 Fr	Respiratory rate (per min)	20
Intraosseous needle size	15G	PEEP (cmH ₂ O)	5
Intraosseous needle depth	15mm	I:E ratio	1:2
Nasogastric tube size	14 to 18 Fr	Inspiratory time (s)	1 (33%)
IV access	16 to 20G	PS / ASB (cmH ₂ O)	10
BP cuff	Small adult	Inspiratory pause / T _{plat} (s)	0
Laryngeal mask airway	Size 3	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal tube airway	Size 2.5	Peak flow (L/min)	>30
CVC size	7 to 8.5 Fr	Ramp waveform	Decelerating
CVC depth	120 to 140mm	Volume Control	32kg 36kg
Airtaq™	Size 2 (Green)	Tidal volume (mL)	192 216
		Minute volume (L)	3.84 4.32
		Pressure Control	32kg 36kg
		PIP (cmH ₂ O)	20

Chart 5.95

Young Adolescent			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	32kg	36kg
Aciclovir 10mg/kg/dose tds	500mg/20mL (25mg/mL)	13	14
Amikacin 25mg/kg loading dose	1g/20mL (50mg/mL)	16	18
Amoxicillin 30mg/kg/dose tds	1g/20mL (50mg/mL)	18	20
Amoxy-clav 32mg/kg/dose tds	1.2g/20mL (60mg/mL)	17	19
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	8	9
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	8	9
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	32	36
Cefazolin 20mg/kg/dose tds	1g/20mL (50mg/mL)	13	14
Cefepime 50mg/kg/dose bd	2g/20mL (100mg/mL)	16	18
Ceftriaxone 100mg/kg/dose bd	2g/20mL (100mg/mL)	20	20
Cefuroxime 40mg/kg/dose tds	1.5g/20mL (75mg/mL)	17	19
Ciprofloxacin 10mg/kg/dose tds	400mg/200mL (2mg/mL)	160	180
Clindamycin 20mg/kg/dose tds	800mg/20mL (40mg/mL)	16	18
Cloxacillin 25mg/kg/dose qid	1g/20mL (50mg/mL)	16	18
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	6	7
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	16	18
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	96	100
Gentamicin 8mg/kg loading dose	320mg/20mL (16mg/mL)	16	18
Levofloxacin 10mg/kg/dose od	500mg/100mL (5mg/mL)	64	72
Linezolid 10mg/kg/dose tds	400mg/200mL (2mg/mL)	160	180
Meropenem 40mg/kg/dose tds	2g/40mL (50mg/mL)	26	29
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	48	54
Penicillin G 100kU/kg/dose qid	4MU/20mL (200kU/mL)	16	18
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	40	45
Quinine 20mg/kg/dose loading dose	600mg/100mL D5W (6mg/mL)	100	100
Teicoplanin 10mg/kg/dose bd	400mg/20mL (20mg/mL)	16	18
Vancomycin 20mg/kg/dose bd	1g/50mL (20mg/mL)	32	36

Chart 5.96

32kg	32kg	32kg	32kg	32kg	32kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	3		
Adenosine next doses 0.2mg/kg	10	12mg/4mL + 2mL dil. (2mg/mL)	3		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.4		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	3		
Amiodarone 5mg/kg	10	300mg/6mL + 4mL dil. (30mg/mL)	5		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5		
Atropine for OP poisoning 0.05mg/kg	10	2mg/4mL + 6mL dil. (0.2mg/mL)	8		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	6		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				320
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				182
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	6		
Calcium gluconate 60mg/kg	20	2g/20mL undiluted (100mg/mL)	19		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	3		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	6		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				96
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				32
Defibrillation 4J/kg					128
Dantrolene 1mg/kg	40mg in 120mL dil. (0.33mg/mL)				96
Desmopressin 0.3µg/kg	10	12µg/3mL + 7mL dil. (1.2µg/mL)	8		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	8		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	1		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.5mg/2mL + 8mL dil. (50µg/mL)	10		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	6		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	4		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	10		
Factor VIII concentrate	500IU/10mL give slowly IV				32
Factor IX concentrate	500IU/10mL give slowly IV				58

Chart 5.97

32kg	32kg	32kg	32kg	32kg	32kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)	3		
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use		640		
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	6		
Fosphenytoin 20mg/kg	20	1g/20mL undiluted (50mg/mL)	13		
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use		480		
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	8		
Glucagon 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	8		
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)	64		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	10		
Hydrocortisone 4mg/kg	10	200mg/4mL + 6mL dil. (20mg/mL)	6		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.3		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	6		
Ketamine IM 4mg/kg	5	100mg/mL undiluted	1.2		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	2.5		
Ketorolac 0.5mg/kg	10	30mg/1mL + 9mL dil. (3mg/mL)	5		
Labetalol 0.2mg/kg	5	5mg/mL undiluted	1.2		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	3		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	6		
Magnesium sulphate 40mg/kg	10	2g/4mL + 6mL dil. (200mg/mL)	6		
Maintenance fluids mL/hr			72		
Mannitol 1g/kg		25g/100mL undiluted (0.25g/mL)	128		
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	3		
Methylprednisolone 2mg/kg	10	125mg/1mL + 9mL dil. (12.5mg/mL)	5		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	3		
Midazolam IM 0.2mg/kg	5	15mg/3mL undiluted (5mg/mL)	1.3		
Morphine 0.05mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2		
N-acetylcysteine IV 150mg/kg	50	6g/30mL + 20mL dil. (120mg/mL)	40		
N-acetylcysteine PO 140mg/kg		400mg sachets	11		

Chart 5.98

32kg	32kg	32kg	32kg	32kg	32kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	5		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	10		
Ondansetron 0.15mg/kg	10	8mg/4mL + 6mL dil. (0.8mg/mL)	6		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	8		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	10		
Paracetamol 15mg/kg	10	10mg/mL undiluted	48		
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)	8		
Phenytoin 20mg/kg	50	750mg/15mL + 35mL dil. (15mg/mL)	43		
Platelets 10mL/kg	Adjust dose to indication; warm before use			320	
Potassium IV/IO for severe hypokalaemia	20	KCl 15% (2mmol/mL) - give SLOWLY	12		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	16		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	6		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	10		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	8		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	6		
Rehydration – mild dehydration		mL/hr for 24hours	110		
Rehydration – moderate dehydration		mL/hr for 24hours	150		
Rehydration – severe dehydration		mL/hr for 24hours	190		
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	6		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	10		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	32		
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	124		
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	6		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	7		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	5		
Tilidine PO 1mg/kg		drops of 2.5mg/drop solution	13		

Chart 5.99

32kg	32kg	32kg	32kg	32kg	32kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	16		
Toxic dose: lidocaine 1% + adrenaline			22		
Toxic dose: bupivacaine 0.5%			19		
Toxic dose: ropivacaine 0.75%			17		
Toxic dose: prilocaine 1%			24		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	10		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	16		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	16		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	8		
Vecuronium 0.1mg/kg	10	4mg into 10mL dil. (0.4mg/mL)	8		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	10		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	0.96		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	4.5		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	13		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	32		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	0.96		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	2.4		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	3.2		
Lidocaine 1g/10mL + 40mL dil.	50	20µg/kg/min	1.9		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	0.96		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	0.96		
Propofol 1% solution undiluted	50	1mg/kg/hr	3.2		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	2.4		

Chart 5.100

36kg	36kg	36kg	36kg	36kg	36kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	4		
Adenosine next doses 0.2mg/kg	10	12mg/4mL + 2mL dil. (2mg/mL)	4		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.4		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4		
Amiodarone 5mg/kg	10	300mg/6mL + 4mL dil. (30mg/mL)	6		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5		
Atropine for OP poisoning 0.05mg/kg	10	2mg/4mL + 6mL dil. (0.2mg/mL)	9		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	7		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use			360	
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL			205	
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	7		
Calcium gluconate 60mg/kg	20	2g/20mL undiluted (100mg/mL)	20		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	3.5		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	7		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use			108	
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.			36	
Defibrillation 4J/kg				144	
Dantrolene 1mg/kg	40mg in 120mL dil. (0.33mg/mL)			108	
Desmopressin 0.3µg/kg	10	12µg/3mL + 7mL dil. (1.2µg/mL)	9		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	8		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	1		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.5mg/2mL + 8mL dil. (50µmg/mL)	10		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	6		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	4		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	11		
Factor VIII concentrate	500IU/10mL give slowly IV			36	
Factor IX concentrate	500IU/10mL give slowly IV			65	

Chart 5.101

36kg	36kg	36kg	36kg	36kg	36kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)	4		
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use		720		
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	7		
Fosphenytoin 20mg/kg	20	1g/20mL undiluted (50mg/mL)	15		
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before use		540		
Furosemide 0.5mg/kg	10	20mg/2mL + 8mL dil. (2mg/mL)	9		
Glucagon 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	9		
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)	72		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	10		
Hydrocortisone 4mg/kg	10	200mg/4mL + 6mL dil. (20mg/mL)	7		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.35		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	7		
Ketamine IM 4mg/kg	5	100mg/mL undiluted	1.4		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	2.5		
Ketorolac 0.5mg/kg	10	30mg/1mL + 9mL dil. (3mg/mL)	6		
Labetalol 0.2mg/kg	5	5mg/mL undiluted	1.5		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	4		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	7		
Magnesium sulphate 40mg/kg	10	2g/4mL + 6mL dil. (200mg/mL)	7		
Maintenance fluids mL/hr			76		
Mannitol 1g/kg		25g/100mL undiluted (0.25g/mL)	144		
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	4		
Methylprednisolone 2mg/kg	10	125mg/1mL + 9mL dil. (12.5mg/mL)	6		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	3.5		
Midazolam IM 0.2mg/kg	5	15mg/3mL undiluted (5mg/mL)	1.5		
Morphine 0.05mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2		
N-acetylcysteine IV 150mg/kg	50	6g/30mL + 20mL dil. (120mg/mL)	45		
N-acetylcysteine PO 140mg/kg		400mg sachets	13		

Chart 5.102

36kg	36kg	36kg	36kg	36kg	36kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	6		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	12		
Ondansetron 0.15mg/kg	10	8mg/4mL + 6mL dil. (0.8mg/mL)	7		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	9		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	10		
Paracetamol 15mg/kg	10	10mg/mL undiluted	54		
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)	9		
Phenytoin 20mg/kg	50	750mg/15mL + 35mL dil. (15mg/mL)	48		
Platelets 10mL/kg	Adjust dose to indication; warm before use				360
Potassium IV/IO for severe hypokalaemia	20	KCl 15% (2mmol/mL) - give SLOWLY	14		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	18		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	5.5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	7		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	11		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	9		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	7		
Rehydration – mild dehydration	mL/hr for 24hours				120
Rehydration – moderate dehydration	mL/hr for 24hours				165
Rehydration – severe dehydration	mL/hr for 24hours				210
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	7		
Salbutamol 15µg/kg	10	500µg/1mL + 9mL dil. (50µg/mL)	10		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	36		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				140
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	7		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	7		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	6		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				14

Chart 5.103

36kg	36kg	36kg	36kg	36kg	36kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	18		
Toxic dose: lidocaine 1% + adrenaline			25		
Toxic dose: bupivacaine 0.5%			22		
Toxic dose: ropivacaine 0.75%			19		
Toxic dose: prilocaine 1%			28		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	11		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	18		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	18		
Vasopressin 0.5U/kg	10	20U/1mL + 9mL dil. (2U/mL)	9		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	10		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	10		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	1.1		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	5		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	14		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	36		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	1.1		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	2.7		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	3.6		
Lidocaine 1g/10mL + 40mL dil.	50	20µg/kg/min	2.2		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	1.1		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	1.1		
Propofol 1% solution undiluted	50	1mg/kg/hr	3.6		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	2.7		

Chart 5.104

Adolescent / Small Adult		42kg 48kg	
Resuscitation Equipment		Normal Vital Signs	
Laryngoscope blade	3	Average BP (mmHg)	115/68mmHg
ETT size cuffed	7.0mm	Maximum SBP (mmHg)	136
ETT size uncuffed	-	Minimum SBP (mmHg)	92
ETT depth	20.5 to 21.5cm	Heart rate (per min)	73 (50, 98)
Introducer	14 Fr (4.7mm)	Respiratory rate (per min)	16 (12, 21)
Bougie	14 Fr (4.7mm)	Urine output (mL/hour)	48 to 54
Oropharyngeal airway	80mm / Size 3	Peak expiratory flow (L/min)	290
Nasopharyngeal airway	7 x 125mm	Body surface area (m ²)	1.16
Bag-valve resuscitator	Adult	Initial Ventilator Settings 1. Select SIMV rather than IPPV or CMV if possible 2. Select PRVC, PC or VC mode dependent on scenario 3. Pressure limits VC: max. plateau pressure of 25cmH ₂ O 4. Pressure limits PC: max. total PIP of 25cmH ₂ O	
Mask	Triangular 3 to 5		
Suction catheter	10 to 12 Fr		
Heat-moisture exchanger	± 25mL	F _I O ₂	100%
Intercostal drain size	28 to 36 Fr	Respiratory rate (per min)	20
Urethral catheter	12 Fr	PEEP (cmH ₂ O)	5
Intraosseous needle size	15G	I:E ratio	1:2
Intraosseous needle depth	15mm	Inspiratory time (s)	1 (33%)
Nasogastric tube size	14 to 18 Fr	PS / ASB (cmH ₂ O)	10
IV access	14 to 20G	Inspiratory pause / T _{plat} (s)	0
BP cuff	Adult	Trigger (L/min or cmH ₂ O)	0.3 or -2
Laryngeal mask airway	Size 3	Peak flow (L/min)	>40
Laryngeal tube airway	Size 3 to 4	Ramp waveform	Decelerating
CVC size	7.5 to 8.5 Fr	Volume Control	42kg 48kg
CVC depth	140 to 160mm	Tidal volume (mL)	252 288
Airtraq™	Size 2 (Green)	Minute volume (L)	5.1 5.8
		Pressure Control	42kg 48kg
		PIP (cmH ₂ O)	20

Chart 5.105

Adolescent / Small Adult			
Antimicrobial	Preparation - Dilute the drug to the final proportions indicated	42kg	48kg
Aciclovir 10mg/kg/dose tds	500mg/20mL (25mg/mL)	17	19
Amikacin 20mg/kg loading dose	1g/20mL (50mg/mL)	17	19
Amoxicillin 30mg/kg/dose tds	1g/20mL (50mg/mL)	20	20
Amoxy-clav 32mg/kg/dose tds	1.2g/20mL (60mg/mL)	20	20
Amphotericin B 1mg/kg od	50mg/12mL WFI; dilute the indicated volume at least 20-fold with D5W	10	12
Artesunate 2.4mg/kg/dose bd (first 2 days)	Reconstitute 60mg with 1mL diluent then add 5mL NS to make 10mg/mL solution	10	12
Azithromycin 10mg/kg/dose od	500mg/50mL (10mg/mL)	42	48
Cefazolin 20mg/kg/dose tds	1g/20mL (50mg/mL)	17	19
Cefepime 50mg/kg/dose bd	2g/20mL (100mg/mL)	20	20
Ceftriaxone 100mg/kg/dose bd	2g/20mL (100mg/mL)	20	20
Cefuroxime 40mg/kg/dose tds	1.5g/20mL (75mg/mL)	20	20
Ciprofloxacin 10mg/kg/dose tds	400mg/200mL (2mg/mL)	200	200
Clindamycin 20mg/kg/dose tds	800mg/20mL (40mg/mL)	20	20
Cloxacillin 25mg/kg/dose qid	1.5g/20mL (75mg/mL)	14	16
Cotrimoxazole 0.2mL/kg/dose qid	undiluted (16mg/80mg/mL)	8	10
Erythromycin 25mg/kg/dose qid	1g/20mL (50mg/mL)	20	20
Fluconazole 6mg/kg/dose od	200mg/100mL (2mg/mL)	100	100
Gentamicin 8mg/kg loading dose	320mg/20mL (16mg/mL)	20	20
Levofloxacin 10mg/kg/dose od	500mg/100mL (5mg/mL)	84	96
Linezolid 10mg/kg/dose tds	400mg/200mL (2mg/mL)	200	200
Meropenem 40mg/kg/dose tds	2g/40mL (50mg/mL)	34	38
Metronidazole 7.5mg/kg/dose tds	500mg/100mL (5mg/mL)	63	72
Penicillin G 100kU/kg/dose qid	5MU/20mL (250KU/mL)	17	19
Pip-tazo 100mg/kg/dose tds	4g/0.5g in 50mL (80mg/10mg/mL)	50	50
Quinine 20mg/kg/dose loading dose	600mg/100mL D5W (6mg/mL)	100	100
Teicoplanin 10mg/kg/dose bd	400mg/20mL (20mg/mL)	20	20
Vancomycin 20mg/kg/dose bd	1g/50mL (20mg/mL)	42	48

Chart 5.106

42kg	42kg	42kg	42kg	42kg	42kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	4		
Adenosine next doses 0.2mg/kg	10	12mg/4mL + 2mL dil. (2mg/mL)	4		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.5		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	4		
Amiodarone 5mg/kg	10	300mg/6mL + 4mL dil. (30mg/mL)	7		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5		
Atropine for OP poisoning 0.05mg/kg	10	2mg/4mL undiluted (0.5mg/mL)	2		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	8		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				420
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				240
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	8		
Calcium gluconate 60mg/kg	50	3g/30mL undiluted (100mg/mL)	25		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	4		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	8		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				126
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				42
Defibrillation 4J/kg					adult
Dantrolene 1mg/kg	80mg in 240mL dil. (0.33mg/mL)				126
Desmopressin 0.3µg/kg	10	12µg/3mL + 7mL dil. (1.2µg/mL)	10		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	8		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	1		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.75mg/3mL + 7mL dil. (75µg/mL)	8		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	8		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	5		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	13		
Factor VIII concentrate	500IU/10mL give slowly IV				42
Factor IX concentrate	500IU/10mL give slowly IV				76

Chart 5.107

42kg	42kg	42kg	42kg	42kg	42kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)	4		
Fluid bolus (warm fluids) 20mL/kg		Adjust dose to indication; warm before use	840		
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	8		
Fosphenytoin 20mg/kg	20	1g/20mL undiluted (50mg/mL)	16		
Fresh frozen plasma 15mL/kg		Adjust dose to indication; warm before use	630		
Furosemide 0.5mg/kg	10	20mg/2mL undiluted (20mg/mL)	2		
Glucagon 0.05mg/kg	10	2mg/2mL undiluted (1mg/mL)	2		
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)	84		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	10		
Hydrocortisone 4mg/kg	10	200mg/4mL + 6mL dil. (20mg/mL)	8		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.4		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	8.5		
Ketamine IM 4mg/kg	5	100mg/mL undiluted	1.6		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	3.2		
Ketorolac 0.5mg/kg	10	30mg/1mL + 9mL dil. (3mg/mL)	7		
Labetalol 0.2mg/kg	5	5mg/mL undiluted	1.7		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	4		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	8		
Magnesium sulphate 40mg/kg	10	2g/4mL + 6mL dil. (200mg/mL)	8		
Maintenance fluids mL/hr			82		
Mannitol 1g/kg		25g/100mL undiluted (0.25g/mL)	168		
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	4		
Methylprednisolone 2mg/kg	10	125mg/1mL + 9mL dil. (12.5mg/mL)	6		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	4		
Midazolam IM 0.2mg/kg	5	15mg/3mL undiluted (5mg/mL)	1.7		
Morphine 0.05mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2		
N-acetylcysteine IV 150mg/kg	50	6g/30mL + 20mL dil. (120mg/mL)	40		
N-acetylcysteine PO 140mg/kg		400mg sachets	15		

Chart 5.108

42kg	42kg	42kg	42kg	42kg	42kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	7		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	13		
Ondansetron 0.15mg/kg	10	8mg/4mL + 6mL dil. (0.8mg/mL)	8		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	10		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	10		
Paracetamol 15mg/kg	10	10mg/mL undiluted	63		
Phenobarbitone 10mg/kg	10	400mg/2mL + 8mL dil. (20mg/mL)	10		
Phenytoin 20mg/kg	50	1g/20mL + 30mL dil. (20mg/mL)	42		
Platelets 10mL/kg	Adjust dose to indication; warm before use			420	
Potassium IV/IO for severe hypokalaemia	20	KCl 15% (2mmol/mL) - give SLOWLY	16		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	20		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	6.5		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	8		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	12		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	10		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	8		
Rehydration – mild dehydration		mL/hr for 24hours	135		
Rehydration – moderate dehydration		mL/hr for 24hours	185		
Rehydration – severe dehydration		mL/hr for 24hours	240		
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	8		
Salbutamol 15µg/kg	10	1mg/2mL + 8mL dil. (100µg/mL)	6.5		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	42		
Sodium replacement		mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L	163		
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	8		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	8		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	7		
Tilidine PO 1mg/kg		drops of 2.5mg/drop solution	16		

Chart 5.109

42kg	42kg	42kg	42kg	42kg	42kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	20		
Toxic dose: lidocaine 1% + adrenaline			29		
Toxic dose: bupivacaine 0.5%			25		
Toxic dose: ropivacaine 0.75%			22		
Toxic dose: prilocaine 1%			33		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	13		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	20		
Valproate 20mg/kg	20	800mg/8mL + 12mL dil. (40mg/mL)	20		
Vasopressin 0.5U/kg	10	40U/2mL + 8mL dil. (4U/mL)	5		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	10		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	10		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	1.3		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	5.8		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	17		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	42		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	1.3		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	3.2		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	4.2		
Lidocaine 1g/10mL + 40mL dil.	50	20µg/kg/min	2.5		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	1.3		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	1.3		
Propofol 1% solution undiluted	50	1mg/kg/hr	4.2		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	3.2		

Chart 5.110

48kg	48kg	48kg	48kg	48kg	48kg
Medication	Syringe (mL)	Preparation	mL		
Adenosine 1 st dose 0.1mg/kg	10	6mg/2mL + 4mL dil. (1mg/mL)	5		
Adenosine next doses 0.2mg/kg	10	12mg/4mL + 2mL dil. (2mg/mL)	5		
Adrenaline IM	1	1:1000 solution undiluted (1mg/mL)	0.5		
Adrenaline IV/IO 0.01mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	5		
Amiodarone 5mg/kg	10	300mg/6mL + 4mL dil. (30mg/mL)	8		
Atropine 0.02mg/kg	5	0.5mg/1mL + 4mL dil. (0.1mg/mL)	5		
Atropine for OP poisoning 0.05mg/kg	10	3mg/6mL undiluted (0.5mg/mL)	2.5		
Biperiden 0.1mg/kg	10	5mg/1mL + 9mL dil. (0.5mg/mL)	10		
Blood bolus 10mL/kg	Adjust dose to indication; warm before use				480
Blood packed cells transfusion	mL to ↑ Hb by 1g/dL				274
Calcium chloride 20mg/kg	10	1g/10mL undiluted (100mg/mL)	10		
Calcium gluconate 60mg/kg	50	3g/30mL undiluted (100mg/mL)	29		
Chlorpheniramine 0.1mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	5		
Clonazepam 0.02mg/kg	10	1mg/1mL + 9mL dil. (0.1mg/mL)	10		
Cryoprecipitate 3mL/kg	Adjust dose to indication; warm before use				144
Cardioversion 1J/kg	Joules - use the closest higher setting to the indicated energy level if this exact setting is not available. This may vary from machine to machine.				48
Defibrillation 4J/kg					adult
Dantrolene 1mg/kg	80mg in 240mL dil. (0.33mg/mL)				144
Desmopressin 0.3µg/kg	10	16µg/4mL + 6mL dil. (1.6µg/mL)	9		
Dexamethasone 0.6mg/kg	5	4mg/2mL undiluted (2mg/mL)	8		
Diazepam IV/IO 0.2mg/kg	1	10mg/2mL undiluted (5mg/mL)	1		
Diazepam PR 0.5mg/kg	5	10mg/2mL undiluted (5mg/mL)	2		
Digoxin 15µg/kg first dose	10	0.75mg/3mL + 7mL dil. (75µg/mL)	10		
Diphenhydramine 1mg/kg	10	50mg/1mL + 9mL dil. (5mg/mL)	10		
Ephedrine 0.3mg/kg	20	50mg/1mL + 19mL dil. (2.5mg/mL)	6		
Etomidate 0.3mg/kg	20	20mg/10mL + 10mL dil. (1mg/mL)	14		
Factor VIII concentrate	500IU/10mL give slowly IV				48
Factor IX concentrate	500IU/10mL give slowly IV				86

Chart 5.111

48kg	48kg	48kg	48kg	48kg	48kg
Medication	Syringe (mL)	Preparation	mL		
Fentanyl 1µg/kg	10	100µg/2mL + 8mL dil. (10µg/mL)	5		
Fluid bolus (warm fluids) 20mL/kg	Adjust dose to indication; warm before use				960
Flumazenil 0.01mg/kg	10	0.5mg/5mL + 5mL dil. (0.05mg/mL)	10		
Fosphenytoin 20mg/kg	20	1g/20mL undiluted (50mg/mL)	19		
Fresh frozen plasma 15mL/kg	Adjust dose to indication; warm before				720
Furosemide 0.5mg/kg	10	20mg/2mL undiluted (20mg/mL)	2		
Glucagon 0.05mg/kg	10	2mg/2mL undiluted (1mg/mL)	2		
Glucose (D25W) 0.5g/kg	50	25mL D50W + 25mL dil. (0.25g/mL)	96		
Glycopyrrolate 0.01mg/kg	10	0.2mg/1mL + 9mL dil. (0.02mg/mL)	10		
Hydrocortisone 4mg/kg	10	200mg/4mL + 6mL dil. (20mg/mL)	10		
Insulin (soluble) 0.1U/kg	1	10U/0.1mL undiluted	0.5		
Ketamine IV/IO 2mg/kg	5	10mg/mL undiluted	10		
Ketamine IM 4mg/kg	5	100mg/mL undiluted	2		
Ketofol 0.75mg/kg ketamine and propofol	5	mL of propofol 1% + ketamine 1%	3.6		
Ketorolac 0.5mg/kg	10	30mg/1mL + 9mL dil. (3mg/mL)	8		
Labetalol 0.2mg/kg	5	5mg/mL undiluted	2		
Lidocaine 1mg/kg	10	100mg/5mL + 5mL dil. (10mg/mL)	5		
Lorazepam 0.1mg/kg	10	4mg/1mL + 7mL dil. (0.5mg/mL)	8		
Magnesium sulphate 40mg/kg	10	2g/4mL + 6mL dil. (200mg/mL)	10		
Maintenance fluids mL/hr					88
Mannitol 1g/kg	25g/100mL undiluted (0.25g/mL)				192
Methylene blue 1mg/kg	10	100mg/10mL undiluted (10mg/mL)	5		
Methylprednisolone 2mg/kg	10	125mg/1mL + 9mL dil. (12.5mg/mL)	8		
Midazolam IV/IO 0.1mg/kg	5	5mg/5mL undiluted (1mg/mL)	5		
Midazolam IM 0.2mg/kg	5	15mg/3mL undiluted (5mg/mL)	2		
Morphine 0.05mg/kg	10	10mg/1mL + 9mL dil. (1mg/mL)	2.5		
N-acetylcysteine IV 150mg/kg	50	8g/40mL + 10mL dil. (160mg/mL)	45		
N-acetylcysteine PO 140mg/kg	400mg sachets				17

Chart 5.112

48kg	48kg	48kg	48kg	48kg	48kg
Medication	Syringe (mL)	Preparation	mL		
Naloxone full dose 0.1mg/kg	5	0.4mg/mL undiluted	5		
Neostigmine 0.04mg/kg	10	2.5mg/1mL + 9mL dil. (0.25mg/mL)	8		
Obidoxime 4mg/kg	20	250mg/1mL + 19mL dil. (12.5mg/mL)	15		
Ondansetron 0.15mg/kg	10	8mg/4mL + 6mL dil. (0.8mg/mL)	9		
Pancuronium 0.1mg/kg	10	4mg/2mL + 8mL dil. (0.4mg/mL)	10		
Pantoprazole 2mg/kg	10	40mg/2mL + 8mL dil. (4mg/mL)	10		
Paracetamol 15mg/kg	10	10mg/mL undiluted	72		
Phenobarbitone 10mg/kg	10	800mg/4mL + 6mL dil. (80mg/mL)	6		
Phenytoin 20mg/kg	50	1g/20mL + 30mL dil. (20mg/mL)	48		
Platelets 10mL/kg	Adjust dose to indication; warm before use				480
Potassium IV/IO for severe hypokalaemia	20	KCl 15% (2mmol/mL) - give SLOWLY	18		
Pralidoxime 25mg/kg	20	1g in 20mL dil. (50mg/mL)	20		
Procainamide 15mg/kg	10	1g/10mL undiluted (100mg/mL)	7		
Promethazine 0.5mg/kg	10	25mg/1mL + 9mL dil. (2.5mg/mL)	10		
Propofol 3mg/kg	5	1% solution undiluted (10mg/mL)	14		
Pyridostigmine 0.05mg/kg	10	2mg/2mL + 8mL dil. (0.2mg/mL)	10		
Ranitidine 1mg/kg	10	50mg/2mL + 8mL dil. (5mg/mL)	10		
Rehydration – mild dehydration	mL/hr for 24hours				150
Rehydration – moderate dehydration	mL/hr for 24hours				210
Rehydration – severe dehydration	mL/hr for 24hours				270
Rocuronium 1mg/kg	10	50mg/5mL + 5mL dil. (5mg/mL)	8		
Salbutamol 15µg/kg	10	1mg/2mL + 8mL dil. (100µg/mL)	6.5		
Sodium bicarbonate 1meq/kg	10	8.5% solution - dilute before giving	42		
Sodium replacement	mL of NS 0.9% to ↑ Na ⁺ by 1mmol/L				187
Suxamethonium 2mg/kg	10	100mg/2mL + 8mL dil. (10mg/mL)	10		
Thiamine	10	100mg/1mL + 9mL dil. (10mg/mL)	10		
Thiopentone 4mg/kg	20	500mg in 20mL dil. (25mg/mL)	8		
Tilidine PO 1mg/kg	drops of 2.5mg/drop solution				19

Chart 5.113

48kg	48kg	48kg	48kg	48kg	48kg
Medication	Syringe (mL)	Preparation	mL		
Toxic dose: lidocaine 1%		Maximum total cumulative volume of local anaesthetic solution for infiltration and/or blocks	24		
Toxic dose: lidocaine 1% + adrenaline			33		
Toxic dose: bupivacaine 0.5%			28		
Toxic dose: ropivacaine 0.75%			25		
Toxic dose: prilocaine 1%			38		
Tramadol 1.5mg/kg	20	100mg/2mL + 18mL dil. (5mg/mL)	14		
Tranexamic acid 25mg/kg	20	1g/10mL + 10mL dil. (50mg/mL)	20		
Valproate 20mg/kg	20	1.2g/12mL + 8mL dil. (60mg/mL)	16		
Vasopressin 0.5U/kg	10	40U/2mL + 8mL dil. (4U/mL)	6		
Vecuronium 0.1mg/kg	10	4mg in 10mL dil. (0.4mg/mL)	10		
Verapamil 0.25mg/kg	10	5mg/2mL + 8mL dil. (0.5mg/mL)	10		
Vitamin K	10	10mg/1mL + 9mL dil. (1mg/mL)	10		
Emergency Infusions - starting rates		Initiate at	mL/hr		
Adrenaline 10mg/10mL + 40mL dil.	50	0.1µg/kg/min	1.5		
Amiodarone 150mg/3mL + 47mL dil.	50	0.42mg/kg/hr	6.7		
Atropine 25mg/50mL undiluted	50	0.2mg/kg/hr	19		
Bicarbonate 8.5% undiluted	50	1meq/kg/hr	48		
Dobutamine 500mg/40mL + 10mL dil.	50	5µg/kg/min	1.5		
Dopamine 200mg/5mL + 45mL dil.	50	5µg/kg/min	3.7		
Labetalol 400mg/40mL undiluted	50	1mg/kg/hr	4.8		
Lidocaine 1g/10mL + 40mL dil.	50	20µg/kg/min	2.9		
Nitroglycerin 50mg/10mL + 40mL dil.	50	0.5µg/kg/min	1.5		
Phenylephrine 10mg/1mL + 49mL dil.	50	0.1µg/kg/min	1.5		
Propofol 1% solution undiluted	50	1mg/kg/hr	4.8		
Thiopentone 2g + 50mL dil.	50	50µg/kg/min	3.7		

Chart 5.114

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Emergency infusions dosing charts

6

This section contains the full emergency infusion Charts which have been designed for use with a syringe-driver system. The desired strength of the infusion can be selected and the required volume infusion rate read off the Chart.

The drugs that have been included in the Charts are:

- Adrenaline
- Dopamine
- Dobutamine
- Nitroglycerin
- Labetalol
- Phenylephrine
- Nitroprusside
- Midazolam
- Morphine
- Thiopentone
- Propofol
- Salbutamol
- Lidocaine

The first four charts are for children with a weight of 2–11 kg and the last four for children with a weight of 12–48 kg.

Infusion rates in mL/hr - for a 50mL syringe driver system													
Adrenaline 10mg/10mL + 40mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min
	0.1	0.06	0.08	0.1	0.12	0.15	0.18	0.21	0.24	0.27	0.3	0.33	0.1
	0.2	0.12	0.15	0.18	0.24	0.3	0.36	0.42	0.48	0.54	0.6	0.66	0.2
	0.4	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2	1.32	0.4
	0.6	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8	1.98	0.6
	0.8	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4	2.64	0.8
	1	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	1
	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min
Dopamine 200mg/5mL + 45mL dil.	2	0.06	0.07	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3	0.33	2
	5	0.15	0.17	0.23	0.3	0.38	0.45	0.53	0.6	0.68	0.75	0.83	5
	10	0.3	0.38	0.45	0.6	0.75	0.9	1.05	1.2	1.35	1.5	1.65	10
	15	0.45	0.55	0.68	0.9	1.13	1.35	1.58	0.8	2	2.25	2.48	15
	20	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	20
Dobutamine 250mg/20mL + 30mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min
	5	0.12	0.15	0.18	0.24	0.3	0.36	0.42	0.48	0.54	0.6	0.66	5
	10	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2	1.32	10
	15	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.68	1.8	1.98	15
	20	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4	2.64	20
25	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	25	

Infusion rates in mL/hr - for a 50mL syringe driver system														
Nitroglycerin 25mg/5mL + 45mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min	
	0.5	0.12	0.15	0.18	0.24	0.3	0.36	0.42	0.48	0.54	0.6	0.66	0.5	
	1	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2	1.32	1	
	1.5	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8	2	1.5	
	2	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4	2.64	2	
	2.5	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	2.5	
Labetalol 40mg/40mL + 10mL dil.	mg/kg/hr	2	2.5	3	4	5	6	7	8	9	10	11	mg/kg/hr	
	1	0.25	0.32	0.38	0.5	0.63	0.75	0.88	1	1.13	1.25	1.38	1	
	1.5	0.37	0.47	0.56	0.75	0.94	1.13	1.31	1.5	1.69	1.88	2.06	1.5	
	2	0.5	0.63	0.75	1	1.25	1.5	1.75	2	2.25	2.5	2.75	2	
	2.5	0.62	0.78	0.94	1.25	1.56	1.88	2.19	2.5	2.81	3.13	3.44	2.5	
	3	0.75	0.94	1.13	1.5	1.88	2.25	2.63	3	3.38	3.75	4.13	3	
Phenylephrine 10mg/1mL + 49mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min	
	0.05	0.03	0.03	0.05	0.06	0.07	0.09	0.1	0.12	0.14	0.15	0.16	0.05	
	0.1	0.06	0.08	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3	0.33	0.1	
	0.2	0.12	0.15	0.18	0.24	0.3	0.36	0.42	0.48	0.54	0.6	0.66	0.2	
	0.3	0.18	0.22	0.27	0.36	0.45	0.54	0.63	0.72	0.81	0.9	0.99	0.3	
	0.4	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2	1.32	0.4	
0.5	0.3	0.38	0.45	0.6	0.75	0.9	1.05	1.2	1.35	1.5	1.65	0.5		

Infusion rates in mL/hr - for a 50mL syringe driver system														
Nitroprusside 100mg in 50mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min	
		1	0.06	0.07	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3		0.33
		3	0.18	0.22	0.27	0.36	0.45	0.54	0.63	0.72	0.81	0.9		0.99
		5	0.3	0.38	0.45	0.6	0.75	0.9	1.05	1.2	1.35	1.5		1.65
		8	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4		2.64
Midazolam 50mg/5mL + 45mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min	
		2	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2		1.32
		3	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8		1.98
		4	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4		2.64
		5	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3		3.3
Morphine 10mg/1mL + 49mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min	
		5	0.05	0.06	0.1	0.1	0.13	0.15	0.18	0.2	0.23	0.25		0.28
		10	0.1	0.12	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5		0.55
		20	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1		1.1
		40	0.4	0.5	0.6	0.8	1	1.2	1.4	1.6	1.8	2		2.2
Thiopentone 500mg in 50mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min	
		50	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3		3.3
		75	0.9	1.1	1.35	1.8	2.25	2.7	3.05	3.5	3.95	4.4		4.85
		100	1.2	1.5	1.8	2.4	3	3.6	4.2	4.8	5.4	6		6.6

Infusion rates in mL/hr - for a 50mL syringe driver system													
Propofol 10mg/mL undiluted	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min
	30	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8	1.98	30
	40	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4	2.64	40
	50	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	50
	60	0.72	0.9	1.08	1.44	1.8	2.16	2.52	2.88	3.24	3.6	3.96	60
	80	0.96	1.2	1.44	1.92	2.4	2.88	3.36	3.84	4.32	4.8	5.28	80
	100	1.2	1.5	1.8	2.4	3	3.6	4.2	4.8	5.4	6	6.6	100
Salbutamol 50mg/50mL undiluted	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min
	1	0.12	0.15	0.18	0.24	0.3	0.36	0.42	0.48	0.54	0.6	0.66	1
	2	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2	1.32	2
	3	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8	1.98	3
	4	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4	2.64	4
	5	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	5
	7.5	0.9	1.12	1.35	1.8	2.25	2.7	3.15	3.6	4.05	4.5	4.95	7.5
Lidocaine 500mg/5mL + 45mL dil.	µg/kg/min	2	2.5	3	4	5	6	7	8	9	10	11	µg/kg/min
	20	0.24	0.3	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2	1.32	20
	30	0.36	0.45	0.54	0.72	0.9	1.08	1.26	1.44	1.62	1.8	1.98	30
	40	0.48	0.6	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4	2.64	40
	50	0.6	0.75	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	50

Infusion rates in mL/hr - for a 50mL syringe driver system														
Adrenaline 20mg/20mL + 30mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	0.1	0.18	0.21	0.24	0.27	0.3	0.33	0.36	0.42	0.48	0.54	0.63	0.72	0.1
	0.2	0.36	0.42	0.48	0.54	0.6	0.66	0.72	0.84	0.96	1.08	1.26	1.44	0.2
	0.4	0.72	0.84	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.52	2.88	0.4
	0.6	1.08	1.26	1.44	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.78	4.32	0.6
	0.8	1.44	1.68	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.76	0.8
	1	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	1
Dopamine 200mg/5mL + 45mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	2	0.36	0.42	0.48	0.54	0.6	0.66	0.72	0.84	0.96	1.08	1.26	1.44	2
	5	0.9	1.05	1.2	1.35	1.5	1.65	1.8	2.1	2.4	2.7	3.15	3.6	5
	10	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	10
	15	2.7	3.15	3.6	4.05	4.5	4.95	5.4	6.3	7.2	8.1	9.45	10.8	15
	20	3.6	4.2	4.8	5.4	6	6.6	7.2	8.4	9.6	10.8	12.6	14.4	20
Dobutamine 500mg/40mL + 10mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	5	0.12	0.15	0.48	0.54	0.6	0.66	0.72	0.84	0.96	1.08	1.2	1.44	5
	10	0.24	0.3	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.4	2.88	10
	15	0.36	0.45	1.44	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.6	4.32	15
	20	0.48	0.6	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.76	20
	25	0.6	0.75	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6	7.2	25

Infusion rates in mL/hr - for a 50mL syringe driver system														
Nitroglycerin 50mg/10mL + 40mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	0.5	0.36	0.42	0.48	0.54	0.6	0.66	0.72	0.84	0.96	1.08	1.26	1.44	0.5
	1	0.72	0.84	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.52	2.88	1
	1.5	1.08	1.26	1.44	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.78	4.32	1.5
	2	1.44	1.68	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.76	2
	2.5	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	2.5
Labetalol 10mg/mL undiluted	mg/kg/hr	12	14	16	18	20	22	24	28	32	36	42	48	mg/kg/hr
	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.8	3.2	3.6	4.2	4.8	1
	1.5	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	1.5
	2	2.4	2.8	3.2	3.6	4	4.4	4.8	5.6	6.4	7.2	8.4	9.6	2
	2.5	3	3.5	4	4.5	5	5.5	6	7	8	9	10.5	12	2.5
3	3.6	4.2	4.8	5.4	6	6.6	7.2	8.4	9.6	10.8	12.6	14.4	3	
Phenylephrine 10mg/1mL + 49mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	0.05	0.18	0.21	0.24	0.27	0.3	0.33	0.36	0.42	0.48	0.54	0.63	0.72	0.05
	0.1	0.36	0.42	0.48	0.54	0.6	0.66	0.72	0.84	0.96	1.08	1.26	1.44	0.1
	0.2	0.72	0.84	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.52	2.88	0.2
	0.3	1.08	1.26	1.44	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.78	4.32	0.3
	0.4	1.44	1.68	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.28	0.4
0.5	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	0.5	

Infusion rates in mL/hr - for a 50mL syringe driver system														
Nitroprusside 100mg in 50mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	1	0.36	0.42	0.48	0.54	0.6	0.66	0.72	0.84	0.96	1.08	1.26	1.44	1
	3	1.08	1.26	1.48	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.78	4.32	3
	5	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	5
	8	2.88	3.36	3.84	4.32	4.8	5.28	5.76	6.72	7.68	8.64	10.1	11.5	8
Midazolam 100mg/10mL + 40mL	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	2	0.72	0.84	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.52	2.88	2
	3	1.08	1.26	1.44	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.78	4.32	3
	4	1.44	1.68	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.76	4
	5	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	5
Morphine 10mg/1mL + 49mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	5	0.3	0.32	0.4	0.45	0.5	0.55	0.6	0.65	0.8	0.9	1.05	1.2	5
	10	0.6	0.65	0.8	0.9	1	1.1	1.2	1.3	1.6	1.8	2.1	2.4	10
	20	1.2	1.3	1.6	1.8	2	2.2	2.4	2.6	3.2	3.6	4.2	4.8	20
	40	2.4	2.6	3.2	3.6	4	4.4	4.8	5.2	6.4	7.2	8.4	9.6	40
Thiopentone 2000mg in 50mL dil.	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	50	0.9	1.05	1.2	1.4	1.5	1.7	1.8	2.1	2.4	2.7	3	3.3	50
	75	1.35	1.6	1.8	2.1	2.25	2.5	2.7	3.2	3.6	3.95	4.4	4.85	75
	100	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6	6.6	100

Infusion rates in mL/hr - for a 50mL syringe driver system														
Propofol 10mg/mL undiluted	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	30	2.2	2.5	2.9	3.2	3.6	4	4.3	5	5.8	6.5	7.6	8.6	30
	40	2.9	3.4	3.84	4.3	4.8	5.3	5.8	6.7	7.7	8.6	10	11.6	40
	50	3.6	4.2	4.8	5.4	6	6.6	7.2	8.4	9.6	10.8	12.6	14.4	50
	60	4.3	5.1	5.8	6.5	7.2	7.9	8.6	10.1	11.5	13	15.2	17.2	60
	80	5.8	6.7	7.7	8.6	9.6	10.6	11.5	13.4	15.4	17.3	20.2	23	80
	100	7.2	8.4	9.6	10.9	12	13.2	14.4	16.8	19.2	21.6	25.2	28.8	100
	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	1	0.72	0.84	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.52	2.88	1
Salbutamol 50mg/50mL undiluted	2	1.44	1.68	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.76	2
	3	2.16	2.52	2.88	3.24	3.6	3.96	4.32	5.04	5.76	6.48	7.56	8.64	3
	4	2.88	3.36	3.84	4.32	4.8	5.28	5.76	6.72	7.68	8.64	10.1	11.52	4
	5	3.6	4.2	4.8	5.4	6	6.6	7.2	8.4	9.6	10.8	12.6	14.4	5
	7.5	5.4	6.3	7.2	8.1	9	9.9	10.8	12.6	14.4	16.2	18.9	21.6	7.5
Lidocaine 1000mg/10mL + 40mL	µg/kg/min	12	14	16	18	20	22	24	28	32	36	42	48	µg/kg/min
	20	0.72	0.84	0.96	1.08	1.2	1.32	1.44	1.68	1.92	2.16	2.52	2.88	20
	30	1.08	1.26	1.44	1.62	1.8	1.98	2.16	2.52	2.88	3.24	3.78	4.32	30
	40	1.44	1.68	1.92	2.16	2.4	2.64	2.88	3.36	3.84	4.32	5.04	5.76	40
	50	1.8	2.1	2.4	2.7	3	3.3	3.6	4.2	4.8	5.4	6.3	7.2	50

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Drug dosing guidelines: pearls and pitfalls

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INTRODUCTION

- These drug profile notes are intended to serve as guidelines for the treatment of children under emergency conditions by trained and appropriately qualified medical professionals – they can never replace sound clinical judgement.
- All doses, unless otherwise specified, must be calculated according to each patient's individual requirements, risks and special circumstances, notwithstanding the dosage that is presented in this material.
- Tracheal drug administration is not recommended other than as a last resort route of administration, and should only be used if intravenous or intraosseous routes are unavailable (and there is seldom a reason not to establish an IO line).
- The general principle of drug administration is that of titrating the minimum dose to the desired effect or response.
- This section should not be considered to be absolute information on the pharmacology of the drugs listed. The science supporting pharmacological management of seriously ill or injured children is dynamic, and currently very limited, with advances being published continually. Readers are advised to check for changes in recommended doses, indications and contraindications in current reliable sources, including the product information sheets; furthermore, drug use should be guided by local protocol and practice – familiarity with current local and national protocols is strongly advocated.
- The drug dose that is used in this book is reflected in this chapter. Where there is a range of doses that are in general use then this is given as well.
- Hypersensitivity is not always mentioned as a contraindication for any drug, although this is an obvious contraindication. In true emergencies, however, if a previous reaction to a drug has not been severe and if there is no alternative agent to use, then that drug or one in the same class may be used with due caution. This is not advised unless the patient's life depends on the intervention.
- Some contraindications are absolute and some relative – ensure that you know the difference. This book won't teach you everything you need to know but will be a useful reminder in times of need.
- Please see Chapter 4 to see what adjustments need to be made for obese children.

ADENOSINE

Overview

The primary use of adenosine in the ED is to terminate SVTs in stable patients.

Indications

- Stable patients with narrow-complex SVT, to terminate arrhythmia. Does not convert atrial fibrillation, atrial flutter or VT, but may transiently slow the ventricular rate – which may be useful diagnostically – without terminating the arrhythmia or controlling the rate in the long term.

- May consider for unstable narrow-complex tachycardia while preparations are made for electrical cardioversion.
- In a stable patient with a regular, narrow-complex or wide complex tachycardia (not known to be a result of WPW syndrome), adenosine is the first-line treatment.

Pharmacological action

- Adenosine decreases automaticity and rate of discharge in SA and AV node cells.
- Adenosine interrupts and terminates supraventricular arrhythmias due to re-entry pathways involving the AV node (i.e. most SVTs).
- SVTs that do not involve the AV node (e.g. WPW syndrome) are usually not terminated by adenosine; this is particularly true for atrial flutter and atrial fibrillation.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 1–2 minutes.

Contraindications

- Sick sinus syndrome; underlying 2° or 3° AV heart block; poisoning or drug induced tachycardia; unstable, irregular or polymorphic wide-complex tachycardia; asthmatic patients (relative contraindication).

Precautions

- Constant ECG monitoring with the patient connected to the monitor-defibrillator.
- WPW – there is a possibility of initiating atrial fibrillation with rapid ventricular responses.
- Avoid in patients taking dipyridamole or carbamazepine (may need to halve dose if required) as co-administration with carbamazepine may produce higher degrees of heart block; dipyridamole may potentiate effects.
- Reduce initial dose in patients with transplanted hearts, or if given by central venous catheter.
- Methylxanthines may antagonize effects of adenosine – it is therefore less effective in patients taking theophylline or caffeine – the usual dose may need to be doubled.
- May cause bronchospasm in asthmatics.
- Patient should be supine or even slightly head-down during administration.

Packaging

- Adenosine phosphate 6 mg/2 mL.

Dosage and administration

First dose

- 0.1 mg/kg IV/IO (maximum 6 mg).

Second and third doses

- 0.2 mg/kg IV (maximum 12 mg) if no response after 2 minutes.
- [Dose range – some experts recommend 0.3 mg/kg as the third dose.]

Miscellaneous notes

- Adenosine is administered by an extremely rapid IV push followed immediately by 5–10 mL NS *rapid* IV push into a large vein.

- Use the two syringe with four hands technique. One person presses the two syringe plungers one after the other, while continuing to maintain pressure on both syringes until they are empty. The other person simultaneously stabilizes the injection port and 3-way stopcock.
- Record rhythm strip during administration – may serve a diagnostic purpose.
- Adenosine should only be used when monitoring, resuscitation equipment and expertise are available.
- Side effects are generally short-lived and last for less than 1 minute.
- If the patient does not experience side-effect symptoms such as flushing and chest discomfort then the dose may not have been effective – increase the dose or rate of administration.

ADRENALINE (EPINEPHRINE)

Overview

Adrenaline has many uses in the ED and can be administered subcutaneously, as an intramuscular injection, intravenously (or via an intraosseous line), via a nebulizer and also, as a route of last resort, down an endotracheal tube.

Indications

- Cardiac arrest (IV/IO) – bolus doses.
- Haemodynamically unstable bradycardia – bolus doses or low dose infusion.
- Anaphylaxis (IM or IV under certain circumstances) for patients with signs of systemic reaction: hypotension, laryngeal oedema or definite difficulty in breathing.
- Impending upper airway obstruction (nebulized) due to inflammation e.g. upper airway infection, inhalational burns.
- Life-threatening severe asthma – SQ or IM.
- Severe hypotension not due to hypovolaemia – as an infusion.

Pharmacological action

- Adrenaline acts on both α and β receptors: it increases both heart rate and contractility (β_1 effects) and it causes dose-dependent peripheral vasodilation (β_2 effect) or vasoconstriction (α effect).
- The primary effect of adrenaline in cardiac arrest is due to its potent α effects which include peripheral vasoconstriction, improved coronary and cerebral blood flow and rendering ventricular fibrillation more susceptible to defibrillation.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 3–5 minutes.

Contraindications

There are no absolute contraindications in a life-threatening emergency setting.

Precautions

Intravenous administration should always be carefully infused in patients not in cardiac arrest.

Packaging

- Adrenaline acid tartrate 1 mg/1 mL (1:1000).
- A pre-filled syringe may be available, containing 1 mg/10 mL (1:10 000). This is a convenient dilution for paediatrics but can also easily be made up by diluting a 1 mg/mL ampoule with 9 mL of NS or WFI.
- Adrenaline auto-injectors may also be available – this delivers an adult dose of 0.3 mg (0.3 mL adrenaline 1:1000), allowing for immediate self-administration. The paediatric form delivers a dose of 0.15 mg (0.15 mL of 1:1000), and should be used in the anterolateral thigh.

Dosage and administration

Cardiac arrest

- 0.01 mg/kg IV/IO push.
- Adrenaline administration, when injected through a peripheral line, should be flushed with at least 5 mL NS to aid entry into the central circulation.
- Tracheal: 0.1 mg/kg, diluted to 3 mL with WFI; tracheal administration is the last resort route of choice – IV/IO definitely preferred.
- Repeat every 3 to 5 minutes.

In cardiac arrest due to anaphylaxis ONLY: extrapolating from the adult recommendation, incrementally higher doses may be considered. The standard 0.01 mg/kg initially, followed by 0.03 mg/kg 3 to 5 minutes later, followed by 0.05 mg/kg, and thereafter an infusion of 0.1–1 µg/kg/min.

Resistant symptomatic (hypotensive) bradycardia

- 0.01 mg/kg IV bolus every 3 minutes.
- 0.1 to 1 µg/kg/min infusion – titrating to effect.

Anaphylaxis

- 0.01 mg/kg IM (use undiluted 1:1000 with a 1 mL syringe).
- Repeat every 5 minutes if no clinical improvement.
- IV (only if life-threatening or unresponsive to IM).
 - Initial: 0.001 mg/kg IV slowly over several minutes (0.1 mL/kg of a 1:100 000 solution).
 - Repeat every 5 minutes if no clinical improvement and consider initiating a constant infusion.

NOTE: IV adrenaline should be given only by those experienced in its use, in a setting where patients can be carefully monitored; it should only be given to children when IV access is already available. Strict vigilance is needed to ensure that the correct strength of adrenaline injection is used. Furthermore, where IM injection might still succeed, time should not be wasted seeking IV access.

Bolus dilution options to achieve 10 µg/mL (1:100 000)

- Dilute 1 mg to 10 mL with NS (i.e. 1:10 000).
 - Further dilute 1 mL of 1:10 000 solution to 10 mL with NS (1:100 000)
 - *Alternatively:* Dilute 2 mg (1:1000) into 200 mL NS = 10 µg/mL (1:100 000).
- Administer 10 µg (1 mL) every 30 seconds, titrating to effect.
If 10 mL is administered IV slowly initially = 100 µg = 0.1 mg.

Life-threatening severe asthma (near fatal asthma)

- This may be initiated immediately on presentation in children with life-threatening asthma, together with nebulised bronchodilator therapy.
 - 0.01 mg/kg IM/SQ (use 1:1000 undiluted, to a maximum of 0.3 mL per dose).

- Repeat: if no clinical improvement, every 20 minutes for a maximum total of three doses.

Croup/laryngeal oedema

- For severe croup, nebulized adrenaline solution 1:1000 (1 mg/mL) should be given with close clinical monitoring in a dose of 0.4 mg/kg (maximum 5 mg), repeated after 30 minutes if necessary. The effects of nebulized adrenaline last 2–3 hours and the child needs to be monitored carefully for recurrence of obstruction.
- Racemic adrenaline is preferred for nebulization whenever possible.
- Nebulization: Initiate with 1 mL of 1:1000 + 4 mL NS. If necessary increase to 2–4 mg adrenaline per nebulization.

Miscellaneous notes

- The use of adrenaline in cardiac arrest has not demonstrated any long-term survival.
- High dose adrenaline should not be used in cardiac arrest as it has been shown to worsen the outcome compared to standard dose adrenaline.
- In children suffering from hypothermia and cardiac arrest, the doses of adrenaline should be spaced at longer intervals (8 to 12 minutes rather than 4 minutes).
- The efficacy of adrenaline is greatly diminished in a severely acidotic patient – consider correcting the acidosis if the adrenaline is not having the expected effect.
- The adrenaline dose for anaphylaxis is to some degree dependent on weight, but a dose of 0.3 mg (0.3 mL of a 1:1000 solution) can safely be used for any size child.
- IM adrenaline should be administered in the anterolateral thigh into the vastus lateralis muscle.

AMIODARONE

Overview

Amiodarone may be used for many arrhythmias in the ED but especially refractory VF/VT as well as stable broad- and narrow-complex tachycardias.

Indications

- For defibrillation-refractory VF and pulseless VT.
- For cardioversion of haemodynamically stable monomorphic wide-complex (>0.09 second) tachycardia.
- Polymorphic ventricular tachycardia with normal QTc interval, (i.e. EXCLUDING torsades de pointes).
- Stable narrow-complex re-entry tachycardias if the rhythm remains uncontrolled by adenosine and vagal manoeuvres, or when these are contraindicated.
- To control rapid ventricular rate due to accessory pathway conduction in pre-excited atrial dysrhythmias.

Pharmacological action

- Amiodarone (an iodine-containing agent) is a class III anti-arrhythmic medication that prolongs phase 3 of the cardiac action potential. It also has a profound effect on the sodium, potassium and calcium channels of the cardiac cells whilst simultaneously blocking both α - and β -adrenergic receptors.

Pharmacokinetics

- Onset of action: 10–15 minutes.
- Duration of action: Unknown (follow up with infusion).

Contraindications

- AV block; sinus bradycardia; SA block; allergy to iodine; prior use of lidocaine; torsades de pointes.

Precautions

- Never to be used with or following lidocaine.
- Must ideally be diluted with D5W; in an emergency and if the drug is to be administered immediately, many experts believe that any diluent may be used.

Packaging

- Amiodarone hydrochloride 150 mg/3 mL (50 mg/mL).

Dosage and administration

Cardiac arrest

- 5 mg/kg amiodarone IV/IO bolus (maximum dose 300 mg).
- Repeat dose if VF or pulseless VT does not respond.
- Follow up bolus dose with an infusion of 10 mg/kg over 24 hours.
- Maximum total cumulative dose of 15 mg/kg IV/IO per 24 hours.

Stable VT or SVT

- 5 mg/kg amiodarone IV/IO loading dose over 20 to 60 minutes (maximum dose 300 mg).
- Follow this with a continuous infusion as above. Only 20% of cases cardiovert within 1 hour, so extended infusion might be required.

Miscellaneous notes

- The surface tension properties of solutions containing injectable amiodarone are altered such that the drop size may be reduced. This reduction may lead to under dosage of the patient by up to 30% if drop counter infusion sets are used. Amiodarone IV must be delivered by a volumetric infusion pump.
- Amiodarone in D5W is incompatible with sodium bicarbonate.
- Amiodarone that is diluted in D5W at concentrations less than 150 mg/250 mL (or <0.6 mg/mL) may be unstable and should ideally not be used for an infusion.

ATROPINE

Overview

Atropine is a versatile anticholinergic agent.

Indications

- Symptomatic bradycardia caused by high vagal tone, associated with unstable signs or symptoms.
- Organophosphate poisoning.
- To control secretions – an antisialagogue.

Pharmacological action

- Atropine acts as a competitive antagonist at muscarinic (cholinergic) receptor sites, blocking the stimulation of parasympathetic nerve fibres.
- Atropine (anticholinergic) effects: positive chronotrope, positive dromotrope, mydriasis, decreased sweat, tears, salivary and pancreatic secretions, reduction in bronchial secretions, bronchodilation, decreased peristalsis, bladder relaxation, sphincter constriction.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 30–60 minutes.

Contraindications

- There are no absolute contraindications in an emergency setting.

Precautions

- Always rule out important causes of bradycardia: hypoxia, hypothermia, raised ICP, hyperkalaemia.
- 2° type II and 3° AV heart blocks with wide QRS complexes (indicating a possible point of origin below the supraventricular conductive tissue) – atropine may induce a paradoxical slowing of the heart rate.
- Paradoxical bradycardia may occur in reaction to small dosages (<0.1 mg).

Packaging

- Atropine sulphate 0.5 mg/1 mL, 0.6 mg/1 mL, 1 mg/1 mL, 1.2 mg/1 mL.

Dosage and administration**Refractory symptomatic bradycardia**

- 0.02 mg/kg IV bolus (minimum dose 0.1 mg, maximum dose 0.5 mg).
- Repeat once after 3 to 5 minutes if required.
- Maximum total dose 0.04 mg/kg IV – total vagolytic dose.

Organophosphate poisoning

- 0.05 mg/kg IV bolus.
- Repeat every 4 minutes until secretions are controlled.
- No absolute maximum dosage.
- An atropine infusion can be initiated early after the diagnosis is made.

Miscellaneous notes

- Atropine is one of those drugs that should always be close at hand in the ED, especially when administering drugs that might cause bradycardias. The routine use of atropine prior to RSI or with ketamine PSA is no longer recommended.
- Atropine should, however, be used as a premedication agent before a second dose of suxamethonium is administered during RSI.

BIPERIDEN**Overview**

Biperiden is an anticholinergic drug that is effective at managing drug-induced acute dystonic reactions.

Indications

- Rapid management of drug-induced acute dystonic reactions.

Pharmacological action

- Blockage of cholinergic transmission produces effects similar to augmentation of dopaminergic transmission because of the creation of an imbalance in the dopamine:acetylcholine ratio.

Pharmacokinetics

- Onset of action: 1–2 minutes.
- Duration of action: 24 hours.

Packaging

- Biperiden hydrochloride 5 mg/1 mL.

Dosage and administration

- 0.1 mg/kg IV slowly.
- This dose may be repeated if necessary.

Miscellaneous notes

- This medication is rapidly effective to obtain resolution of these unpleasant symptoms and is safe in children. Benzodiazepines or antihistamines may also be used but have a greater potential for side effects. The dosage was derived from the manufacturer's age-based dosage.

BLOOD BOLUS

Miscellaneous notes

- Blood boluses at 10 mL/kg may need to be administered after 2 to 3 crystalloid boluses to manage haemorrhagic shock.
- The rate of infusion depends on the clinical scenario, but blood products must always be completely warmed before administration. Repeat as needed.
- If unmatched blood is required, use O-negative blood for females and either O-positive or O-negative blood for males. Consider FFP, platelets and cryoprecipitate if multiple blood boluses (>40 mL/kg) are needed.
- Fresh blood (<5 days old) should be used as it results in a higher survival rate in children requiring resuscitation from major haemorrhage.

BLOOD PACKED CELLS TRANSFUSION

Miscellaneous notes

- This value is the volume of packed cells needed to raise the blood haemoglobin level by 1g/dL (the formula assumes a haematocrit of the packed cells of between 50 and 55%).
- Beware of fluid overload.
- This formula should not be used to calculate blood requirements in the acute phase of haemorrhagic shock.

CALCIUM CHLORIDE/CALCIUM GLUCONATE

Overview

The most important emergency role of IV calcium is for life-threatening hyperkalaemia. It is very important to know the differences between the different formulations of IV calcium to prevent adverse events.

Indications

- Any of the following suspected cardiac arrest or pre-arrest conditions:
 - Hyperkalaemia.
 - Hypocalcaemia.
 - Consider for treatment for hypermagnesaemia.
 - Calcium channel blocker and β -blocker toxicity.

Pharmacological action

- Calcium is essential for the initiation and maintenance of normal muscular contractions.
- Has a positive inotropic effect on cardiac muscle and mediates general vasoconstriction (vascular smooth muscle).

- Calcium is also required to maintain enzymatic reactions and blood coagulation.
- Roughly 40% of plasma calcium is bound to albumin. In hypoalbuminaemia, calcium levels need to be corrected as the level falls by 0.2 mmol/L for every 10g/L decline in plasma albumin.
- Calcium gluconate 10% contains about 9 mg/mL elemental calcium while calcium chloride 10% contains 27 mg/mL elemental calcium.

Pharmacokinetics

- Onset of action: 3–5 minutes.
- Duration of action: 4 hours.

Contraindications

- Not for routine use in resuscitation or cardiac arrest as it may contribute to cellular injury.

Precautions

- Rapid administration may cause bradycardia or asystole – administer over 5 minutes when a pulse is present.
- AVOID in patients receiving digoxin even if they are hyperkalaemic as it may induce arrhythmias.
- Never combine with sodium bicarbonate in the same infusion as calcium carbonate will precipitate.
- A well-placed and free flowing IV line is mandatory as subcutaneously extravasated calcium causes tissue necrosis.

Packaging

- Calcium chloride 1g/10 mL (10% solution).
- Calcium gluconate 1g/10 mL (10% solution).

Dosage and administration

- Calcium chloride 20 mg/kg IV slowly.
- Calcium gluconate 60 mg/kg IV slowly.
- If being administered in a peri-arrest situation, administer at 1 mL/min.

Miscellaneous notes

- Calcium chloride should only be used for acute or urgent indications for IV calcium administration. Calcium gluconate should be used for less urgent conditions because of the greater safety of this solution.
- In significant hyperkalaemia, IV calcium chloride should be the first drug to be administered. It is possible to tell when a sufficient dose has been given because the widened QRS complex narrows into the normal range again (it is broad as a result of the hyperkalaemia).

CARDIOVERSION/DEFIBRILLATION

Overview

The electrical correction of cardiac arrhythmias is an important part of emergency practice. It is essential to be able to perform this procedure safely and effectively in children when required.

Indications

- Cardioversion is used for children suffering from tachyarrhythmias with adverse clinical features (the unstable patient) or medication unresponsive conditions. Cardioversion is synchronized – the ‘sync’ button must be on and the machine recognizing each R wave of each QRS complex.

- Defibrillation is for children who have suffered an arrhythmogenic cardiac arrest (VF or VT). Defibrillation is unsynchronized – the ‘sync’ button must be off.

Pharmacological action

- Successful defibrillation produces brief asystole, due to complete depolarization of the myocardium, which allows the normal organized cardiac conduction to resume.

Precautions

- Ensure safety for yourself and the team – confirm all are clear with a loud deliberate command; oxygen must be at least one metre away, to avoid the potential risk of fire.

Dosage and administration

Defibrillation

- 4J/kg unsynchronized shock.
- Repeat dose – after appropriate ALS treatment the defibrillation dose may be increased in a stepwise fashion to a maximum of 10J/kg.

Cardioversion

- 0.5 to 1J/kg synchronized shock.
- Repeat doses – if the initial attempt is unsuccessful then the dose may be increased to 2J/kg. Remember to confirm that the ‘sync’ button is reactivated after each shock.

Miscellaneous notes

- The single best way of defining an unstable patient is arguably by assessing the level of consciousness – an agitated or lethargic child is showing signs of cerebral hypoperfusion and should be managed aggressively.
- If the exact dosage level is not available on your machine, use the closest *higher* setting.
- A synchronized shock should be used for perfusing arrhythmias except for polymorphic ventricular tachycardias – here an unsynchronized shock will work better.
- There is no evidence on what energy levels should be used with biphasic-waveform cardioversion and the recommendation is to use the same as for monophasic machines.
- It is better to use a manual defibrillator than an AED in children, whenever possible.
- Sedation before cardioversion is desirable as long as it does not unduly delay the procedure: propofol, etomidate and midazolam are good agents if used carefully.
- NOTE: Make sure the ‘sync’ button is switched on before each cardioversion shock, as many machines will reset to defibrillation mode to allow an immediate defibrillation shock if VF develops.
- Ensure that when the monitor is set to *leads* the leads are on the patient, and when the monitor is set to *paddles/pads* that those are being used to conduct the ECG from the patient to the machine. Beware of artefact that might mimic VF. Always check the patient! Don’t treat the monitor!

CHLORPHENIRAMINE

Overview

Chlorpheniramine is an antihistamine that may be used as part of the treatment of serious allergic or anaphylactic reactions.

Indications

- Adjunctive treatment to adrenaline and corticosteroids in the emergency treatment of anaphylaxis and angioedema.

Pharmacological action

- Chlorpheniramine reversibly antagonizes histamine H₁ receptors, which blocks the effects of endogenous histamine.

Pharmacokinetics

- Onset of action: 15 minutes.
- Duration of action: 6–12 hours.

Contraindications

- See PROMETHAZINE.

Precautions

- May cause CNS depression, sedation, drowsiness, lassitude, dizziness, GIT upsets, anorexia, or increased appetite, epigastric pain, blurring of vision, dysuria, dryness of mouth, tightness in chest, hypotension, muscular weakness, tinnitus, euphoria, headache, paradoxical CNS stimulation.
- Chlorpheniramine potentiates the sedative effect of psychotropic drugs such as barbiturates, hypnotics, opioid analgesics, anxiolytics and antipsychotics.

Packaging

- Chlorpheniramine maleate 10 mg/1 mL.

Dosage and administration

- 0.1 mg/kg IV over at least 1 minute.

Miscellaneous notes

- Injection may cause transient hypotension and should be given slowly.

CLONAZEPAM**Overview**

Clonazepam may be used to abort status epilepticus; it has an anticonvulsant effect of longer duration than diazepam, and similar to lorazepam. Like any benzodiazepine it may cause respiratory depression. Little recent information on its use in children is available although it is widely used.

Indications

- Status epilepticus (as an alternative to lorazepam), myoclonic seizures.

Pharmacological action

- See DIAZEPAM.

Pharmacokinetics

- Onset of action: 2–3 minutes.
- Duration of action: 6–8 hours.

Precautions

- Salivary and bronchial hypersecretion.

Packaging

- Clonazepam 1 mg/mL – for dilution with WFI immediately before administration.

Dosage and administration

- 0.02 mg/kg IV slowly.
- A repeat dose may be administered after 5 minutes if required.

Miscellaneous notes

- Clonazepam is a useful alternative agent to lorazepam or diazepam for treating status epilepticus.
- Facilities for managing respiratory depression with mechanical ventilation must be at hand.
- Excipients include benzyl alcohol (avoid in neonates unless there is no safer alternative).

CORTICOSTEROIDS

Overview

There are a myriad uses for corticosteroids in the ED. They are amongst the few drugs where enteral and parenteral administration is equivalent in all but the sickest children. The most commonly used parenteral agents are hydrocortisone, methylprednisolone and dexamethasone, with prednisone the most commonly used oral agent.

Indications

- Severe allergy or anaphylaxis.
- Acute adrenocortical insufficiency.
- Croup.
- Acute asthma.
- Vasogenic cerebral oedema (e.g. from brain tumour or abscess).
- Bacterial meningitis (as adjunctive therapy).
- Severe pneumonia (as adjunctive therapy).
- The use of steroids for spinal cord injury and head injury is no longer recommended.

Pharmacological action

- Hydrocortisone – short-acting.
- Methylprednisolone – intermediate-acting.
- Dexamethasone – long-acting, minimal mineralocorticoid activity, high potency.
- Steroids have both genomic and non-genomic effects. The non-genomic effects are immediate, with the genomic apparent after 4–6 hours.
- Inhibition of inflammatory or allergic reactions – slow onset of action: 6–12 hours.
- Suppression of antibody production and stabilization of mast cell membranes.
- Reduces the number and activation of lymphocytes, eosinophils, mast cells and macrophages, which in turn downregulates the production and release of proinflammatory cytokines.
- Inhibits vascular leak induced by proinflammatory mediators.
- Decreases mucus production.
- Restoration through upregulation of β_2 -receptor responsiveness on cell surface, helping to restore responsiveness to catecholamines.
- Tablets taken via the oral route are as rapid in onset of action as intravenous administration. There is no advantage to parenteral corticosteroids in patients likely to absorb oral corticosteroids well, i.e. conscious, can swallow and not vomiting.

Pharmacokinetics

Hydrocortisone

- Onset of action: 4–6 hours.
- Duration of action: 6–8 hours.

Methylprednisolone

- Onset of action: 4–6 hours.
- Duration of action: 36 hours.

Dexamethasone

- Onset of action: 4–6 hours.
- Duration of action: 48 hours.

Contraindications

- There are no absolute contraindications in life-threatening conditions.

Precautions

- Hypokalaemia develops more readily and may be more severe when corticosteroids are co-administered with other potassium-depleting agents.

Packaging

- Hydrocortisone sodium succinate 100 mg, 250 mg, 500 mg and 1000 mg per vial.
- Methylprednisolone sodium succinate 40 mg/mL, 125 mg/2 mL, 500 mg/8 mL, 1000 mg/16 mL and 2000 mg/32 mL.
- Dexamethasone phosphate 4 mg/1 mL, 10 mg/1 mL.

Dosage and administration**Hydrocortisone**

- 4 mg/kg IV bolus (maximum dose 200 mg).

Methylprednisolone

- 2 mg/kg IV slowly (maximum dose 80 mg).

Dexamethasone

- 0.6 mg/kg IV bolus (maximum dose 16 mg).

Miscellaneous notes

- There is no evidence to prove superiority of one form of corticosteroid over another, as long as equipotent doses are used.

CRYOPRECIPITATE**Overview**

Cryoprecipitate is a blood product prepared from plasma. Each 15 mL unit contains Factor VIII, fibrinogen, vWF, Factor XIII, and fibronectin.

Indications

- Cryoprecipitate is indicated for patients who are actively bleeding associated with significant hypofibrinogenaemia or dysfibrinogenaemia.
- It is often used along with blood, FFP and platelets as part of a massive transfusion protocol in trauma.

Contraindications

- Do not use cryoprecipitate for the treatment of haemophilia, vWD or deficiencies of Factor XIII or fibronectin as the alternative therapies are safer and more effective.

Packaging

- 15 mL single donor units.
- Pooled units of 6 to 10 donor units.

Dosage and administration

- 3 mL/kg infused over 20 to 30 minutes.

Miscellaneous notes

- All blood products must be completely warmed before administration.

DANTROLENE

Overview

Dantrolene is a direct-acting muscle relaxant used in the treatment of malignant hyperthermia.

Indications

- Drug-induced malignant hyperthermia.
- Can be considered as an adjunct for neuroleptic malignant syndrome and heat stroke (both unproven).

Pharmacological action

- Dantrolene binds to the ryanodine receptor which prevents the release of calcium from the sarcoplasmic reticulum. The low intracytoplasmic calcium prevents excitation-contraction coupling in skeletal muscle cells, thereby stopping muscle contractility.

Pharmacokinetics

- Onset of action: 5 minutes.
- Duration of action: 4 hours.

Contraindications

- None – dantrolene is the only possible treatment for malignant hyperthermia.

Precautions

- Administer into a free-flowing IV line as dantrolene causes tissue necrosis.

Packaging

- Dantrolene sodium 20 mg/70 mL (0.29 mg/mL).

Dosage and administration

- 1 mg/kg IV bolus (maximum dose 10 mg/kg).
- Repeat every 5 minutes until muscle relaxation occurs.

Miscellaneous notes

- Control body temperature aggressively.
- Treat the associated acidosis, rhabdomyolysis and electrolyte abnormalities.

DESMOPRESSIN (DDAVP)

Overview

Desmopressin is a synthetic analogue of vasopressin, but is longer-acting and results in minimal vasoconstriction. Its mechanism of action seems multifactorial, including a transient increase in plasma levels of Factor VIII and vWF from endothelial storage sites, stimulation of platelet adhesion, and increased expression of tissue factor.

Indications

- DDAVP is used to control or prevent bleeding in mild haemophilia A, some cases of moderate haemophilia A and some types of vWD.

Pharmacological action

- Desmopressin has Factor VIII releasing activity from endothelial cells and results in an increase in Factor VIII levels in patients with mild haemophilia A and vWD (it is ineffective in severe haemophilia and vWD type II).

Pharmacokinetics

- Onset of action: 30 minutes.
- Duration of action: 6–14 hours.

Contraindications

- Age <3 months.
- Hypertension.
- Renal impairment.

Precautions

- Monitor urea and electrolytes.
- Excessive water intake can cause hyponatraemia with convulsions.

Packaging

- Desmopressin acetate 4 µg/mL.

Dosage and administration

- 0.3 µg/kg IV diluted in NS over 30 minutes (maximum dose 20 µg).
- This dose is expected to raise Factor VIII levels two- to threefold, peaking between 30 and 60 minutes postinfusion.

Miscellaneous notes

- DDAVP may also be used for hyponatraemia and diabetes insipidus.

DEXAMETHASONE

See CORTICOSTEROIDS section, earlier.

DIAZEPAM**Overview**

Diazepam may be used to abort status epilepticus. Lorazepam or clonazepam are better first choice agents because of their longer duration of anticonvulsant action.

Indications

- Anticonvulsant therapy for status epilepticus.

Pharmacological action

- Diazepam is a benzodiazepine acting on the central nervous system to potentiate the neural inhibition that is mediated by GABA receptors.

Pharmacokinetics

- Onset of action: 1–5 minutes.
- Duration of action: 15–120 minutes.

Contraindications

- In a patient with persistent convulsions, there are no absolute contraindications, but due to its ability to cause respiratory depression, it should not be used if the patient cannot be artificially ventilated should the need arise.

Precautions

- Rule out reversible causes of convulsions, e.g. hypoglycaemia.
- Alcohol, barbiturates, opioids and other depressants acting on the central nervous system may enhance or alter the effects of diazepam.

Packaging

- Diazepam 10 mg/2 mL (5 mg/mL).

Dosage and administration

- 0.2 mg/kg IV slowly (maximum dose 10 mg).
- 0.5 mg/kg per rectum (maximum dose 10 mg).
- Repeat every 2–5 minutes as required.
- Titrate to effect (use the lowest effective dosage).

Miscellaneous notes

- IM midazolam has been shown to be as good as or better than rectal diazepam for terminating seizures.
- Only administer during active convulsions and not after the seizure has terminated.
- Do not dilute as the diazepam is in an oil-based carrier which is insoluble in water.

DIGOXIN

Overview

Digoxin has few acute indications other than the control of atrial fibrillation with a rapid ventricular response and may be of limited use in the ED. Discuss with the paediatric cardiologist first before administering IV digoxin.

Indications

- Symptomatic cardiac failure, especially together with rapid atrial fibrillation in the acute setting.
- Control of ventricular rate in atrial fibrillation or atrial flutter.

Pharmacological action

- Inhibits Mg^{2+} dependent Na^+/K^+ -ATPase pump mechanism, which results in increased intracellular Ca^{2+} which in turn potentiates the contractile process – a positive inotrope.
- Enhances parasympathetic activity and decreases sympathetic tone – this increases the effective refractory period of the AV node, reduces the heart rate and markedly slows AV conduction.
- Increased myocardial electrical excitability and automaticity of the Purkinje fibres.
- Stimulates baro- and chemoreceptors, which in turn promotes vasodilation and reduced afterload.
- Children have a decreased sensitivity to dysrhythmias than adults because their myocardial cells are less sensitive to the toxic effects of digoxin.

Pharmacokinetics

- Onset of action: 5–30 minutes.
- Duration of action: Prolonged.

Contraindications

- Ventricular dysrhythmias without congestive cardiac failure.
- Wolff-Parkinson-White syndrome.
- Hypertrophic obstructive cardiomyopathy.
- Incomplete AV nodal block.
- Suspected digoxin toxicity.

Precautions

- Sinus bradycardia.
- Paroxysmal atrial flutter, fibrillation or sick sinus syndrome.
- Decreased plasma K^+ , Mg^{2+} and increased Ca^{2+} predispose to toxicity.

- Acute myocarditis.
- Decreased pulmonary reserve, hypoxia, hypothyroidism, renal impairment and reduced lean body mass.
- In digoxin toxicity, electrical cardioversion is more likely to cause severe dysrhythmias; cardioversion may be performed safely in patients on digoxin provided there is no clinical or ECG evidence of digoxin toxicity. Energy levels half those usually used for synchronized cardioversion are recommended.

Packaging

- Digoxin 0.5 mg/2 mL (0.25 mg/mL).

Dosage and administration

- 15 µg/kg IV over 10 minutes, then 5 µg/kg 6 hourly, then 5 µg/kg 12 hourly.
- Or alternatively: 8–12 µg/kg total loading dose – half of which is given initially over 5 minutes, and the remainder as 25% fractions at 4- to 8-hour intervals.

Miscellaneous notes

- There is a narrow margin between effective therapeutic and toxic doses.
- Digoxin causes hyperkalaemia but do not attempt to correct mild to moderate hyperkalaemia.
- Common toxic effects: anorexia, nausea, vomiting, abdominal pain, dysrhythmias.
- Digoxin (at therapeutic levels) causes some ST segment depression and T-wave inversion, the so-called 'reverse tick' sign.
- Correction of electrolyte imbalance (low K⁺ or Mg²⁺ are common causes of digoxin toxicity) will often reverse dysrhythmias.
- Do NOT use calcium to treat hyperkalaemia – may precipitate VT or VF.
- β-blockers – increased risk of heart block and extreme sinus bradycardia.
- Use digoxin-specific antibody fragments (digoxin immune fab) for toxicity if indicated and available.

DIPHENHYDRAMINE

Overview

Diphenhydramine is an antihistamine agent.

Indications

- Anaphylactic shock, as an adjunctive treatment after adrenaline and corticosteroid administration.
- Treatment of drug-induced dystonic reactions.

Pharmacological action

- See CHLORPHENIRAMINE for antihistamine class drug descriptions.

Pharmacokinetics

- Time of onset: Immediate.
- Duration of action: 4–8 hours.

Packaging

- Diphenhydramine hydrochloride 10 mg/mL, 50 mg/mL.

Dosage and administration

- 1 mg/kg IV slowly (maximum dose 50 mg).

Miscellaneous notes

- Monitor vital signs, especially BP and oxygen saturations, continuously.
- Causes sedation but children are prone to CNS stimulation following antihistamine therapy.

EPHEDRINE

Overview

Ephedrine is a sympathomimetic inotrope and vasoconstrictor. In the ED it is primarily used to counter the effects of drug-induced vasodilation, especially in the context of RSI.

Indications

- Hypotension secondary to vasodilation.

Pharmacological action

- Stimulates both α and β receptors by direct and indirect actions. It causes direct effects by stimulation of receptors and indirect effects by displacing noradrenaline into the synaptic cleft and decreasing noradrenaline re-uptake.
- It increases cardiac output and induces peripheral vasoconstriction and bronchodilation.

Pharmacokinetics

- Onset of action: Within 1 minute.
- Duration of action: 5–10 minutes.

Contraindications

- Hypertrophic cardiomyopathy.
- Thyrotoxicosis.

Precautions

- There may be paradoxical slowing of the heart rate due to the rise in blood pressure. Ensure that hypoxia is not the cause.
- Rapid rise in blood pressure could potentially cause intracerebral haemorrhage.

Packaging

- Ephedrine sulphate 50 mg/mL.

Dosage and administration

- 0.3 mg/kg IV per dose.
- Repeat every 5–10 minutes as required.

Miscellaneous notes

- Repeated use may lead to tachyphylaxis due to depletion of noradrenaline.
- BP should be closely monitored during and 15 minutes after RSI. A drop in BP should be treated immediately with small boluses of ephedrine or phenylephrine.

ETOMIDATE

Overview

Etomidate is generally the drug of choice for RSI in the ED for most circumstances, including for trauma and hypotensive patients. It causes minimal cardiovascular and respiratory depression.

Indications

- Induction agent for rapid sequence intubation.
- Sedative agent for procedural sedation.

Pharmacological action

- Etomidate produces GABA-like inhibitory effects and inhibits excitatory stimuli centrally.
- Etomidate attenuates elevated intracranial pressure by decreasing cerebral blood flow and metabolic oxygen demand.
- Does not cause histamine release; safe for patients with reactive airways disease.
- Has minimal cardiovascular side effects, and no analgesic effect.

Pharmacokinetics

- Onset of action: 15–45 seconds.
- Duration of action: 3–12 minutes.

Contraindications

- Underlying sepsis or pre-existing adrenal insufficiency.

Precautions

- Dosages must be adjusted in haemodynamically compromised patients – generally a half-strength dose is used in these patients.
- Beware of overdosing obese patients if using TBW – titrate to effect.

Packaging

- Etomidate 20 mg/10 mL (2 mg/mL).

Dosage and administration**Induction**

- 0.3 mg/kg IV.
- [Dose range 0.1–0.4 mg/kg.]

PSA

- 0.1 mg/kg IV titrated to appropriate depth of sedation.

Miscellaneous notes

- Causes pain on injection (due to the propylene glycol diluent) that may be decreased by a preceding dose of lidocaine or injection into a fast-flowing IV in a large vein.
- Etomidate may also be used for procedural sedation (especially cardioversion) but propofol or ketamine are generally preferable agents for most indications. If used for PSA then doses should be carefully titrated to effect at about 0.1 mg/kg.
- Avoid using etomidate in very young infants.
- Avoid etomidate use in septic patients.

FACTOR VIII CONCENTRATE**Overview**

Factor VIII is an endogenous glycoprotein necessary for blood clotting and haemostasis.

Indications

- Treatment and prophylaxis of haemorrhage in
 - Congenital Factor VIII deficiency (haemophilia A).
 - Acquired Factor VIII deficiency.
 - vWD with Factor VIII deficiency.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 12 hours.

Precautions

- None for emergency administration.

Packaging

- Factor VIII concentrate 300 IU/vial, 500 IU/vial.

Dosage and administration

- Major bleeds: 40–50 IU/kg IV.
- Minor bleeds: 20–40 IU/kg IV.
- If symptoms persist for more than 24 hours, check for inhibitors.
- Amount Factor VIII required IU = weight (kg) \times 0.5 \times % change in factor activity needed.

Miscellaneous notes

- Recombinant clotting factor concentrates are the product of choice due to viral inactivation.
- Factor VIII is given in sufficient dosage to increase the circulating clotting factors to 75–100% of normal in cases of severe multisystem trauma or head injuries. This amounts to 30 to 60 U/kg (50 U/kg was used in this book).
- Twice daily doses are required for Factor VIII.

FACTOR IX CONCENTRATE**Overview**

Factor IX concentrate products may be used to manage an acute haemorrhage or to decrease the risk of bleeding associated with surgery or trauma in patients with haemophilia B.

Indications

- Treatment and prophylaxis of haemorrhage in congenital Factor IX deficiency (haemophilia B); hereditary disorders of coagulation.
- Can be used to treat warfarin poisoning and Factor X deficiency.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 24 hours.

Contraindications

- Disseminated intravascular coagulation.

Precautions

- None for emergency administration.

Packaging

- Factor IX 500 IU/vial.

Dosage and administration

- Major bleeds 60–90 IU/kg IV.
- Minor bleeds 20–40 IU/kg IV.
- Factor IX has to be administered at higher doses vs. Factor VIII to achieve haemostatic levels.

Miscellaneous notes

- Amount Factor IX required IU = weight (kg) \times % change in factor activity needed.
- Doses differ because Factor IX recovery postinfusion is usually only about 50% of the predicted value (90 U/kg was used in this book).
- Once daily doses are required since half-life of Factor IX is 16–24 hours.

FENTANYL

Overview

Fentanyl provides analgesia with a rapid onset of action and relatively short duration. It has excellent cardiovascular stability. It is a good first agent to use for severe pain in the ED and may be followed up with doses of morphine for a longer duration of analgesia.

Indications

- Analgesia.
- Adjunctive premedication for RSI.

Pharmacological action

- Fentanyl stimulates the opioid μ -receptor to produce analgesic effects.
- It has 100 times the potency of morphine with minimal histamine release.

Pharmacokinetics

- Onset of action: 30–60 seconds.
- Duration of action: 1 hour.

Contraindications

- None other than hypersensitivity in the emergency setting.

Precautions

- The ability, equipment and the means to provide mechanical ventilation and resuscitation must be available.
- Reduce doses in patients that are hypovolaemic or haemodynamically unstable.

Packaging

- Fentanyl citrate 100 μ g/2 mL, 500 μ g/10 mL (50 μ g/mL),

Dosage and administration

- 1 μ g/kg IV slowly.
- Repeat as required after 2 minutes.

Miscellaneous notes

- Fentanyl is an excellent agent for procedural sedation in children.
- Intranasal administration is very effective in children.
- In children with head injury, premedication with fentanyl at high doses prior to RSI has some effect in reducing the effects of the sympathetic stimulation that is provoked by laryngoscopy and tracheal intubation.

FLUID BOLUS

Overview

Intravenous boluses of balanced crystalloid fluids should be administered as the initial step in management of children with evidence of shock, especially if resulting from hypovolaemia.

Dosage and administration

- 20 mL/kg fluid bolus, which can be repeated as required.
- Balanced solutions are preferable to NS.

Miscellaneous notes

- If the patient is bleeding, stop the bleeding first (this may require urgent surgery)!
- Warmed fluids must always be used.

- Boluses must be repeated until a satisfactory clinical response is obtained or consider blood boluses if appropriate.
- The speed of administration depends on the clinical scenario.
- Use smaller volumes for cardiogenic shock. Large volumes may be required for sepsis-related hypotension.
- Hypotonic fluids should never be used for fluid resuscitation therapy.

FLUMAZENIL

Overview

Flumazenil can be used to reverse the effects of benzodiazepines. It has a much shorter duration of action than most benzodiazepines, so respiratory depression may recur after a single dose.

Indications

- Reversal of central nervous system sedative effects and respiratory depression due to benzodiazepines.

Pharmacological action

- Flumazenil competitively inhibits the drug binding at the benzodiazepine recognition site on the GABA/benzodiazepine receptor complex.

Pharmacokinetics

- Onset of action: 1–2 minutes.
- Duration of action: 45 minutes.

Contraindications

- Suspected tricyclic antidepressant overdose or mixed drug overdose.
- Patients with a high risk of convulsions.
- Neonates.

Precautions

- Suspected benzodiazepine addiction.
- The half-life of flumazenil is shorter than that of most benzodiazepines (therefore monitor for recurrence of respiratory depression).

Packaging

- Flumazenil 0.5 mg/5 mL, 1 mg/10 mL (0.1 mg/mL).

Dosage and administration

- 0.01 mg/kg IV slowly.
- May repeat every 1–2 minutes up to a maximum dose of 1 mg.

Miscellaneous notes

- Rather provide respiratory support for benzodiazepine overdose than administer flumazenil because of the potential complications caused by its administration.
- Has been used as a continuous infusion in severe overdoses. Start infusion at 0.005–0.01 mg/kg/hour and adjust according to clinical response. There is little experience with the use in children, so the dose is estimated from the adult dose.

FOSPHENYTOIN

Overview

This is the prodrug form of PHENYTOIN.

Indications

- Control of seizures in status epilepticus.

Pharmacological action

- See PHENYTOIN.

Pharmacokinetics

- Onset of action: 8–15 minutes.
- Duration of action: 12–24 hours.

Contraindications

- Hypersensitivity to fosphenytoin sodium, phenytoin or other hydantoins.
- Sinus bradycardia.
- SA block.
- 2° and 3° AV block.
- Acute intermittent porphyria.

Precautions

- Conversion of fosphenytoin to phenytoin takes about 15 minutes, therefore ensure that the patient has been given another form of anticonvulsant medication prior to starting fosphenytoin.
- Ensure that dosage is converted to Phenytoin Equivalents (PE) – 1.5 mg of fosphenytoin sodium is equivalent to 1 mg phenytoin sodium equivalents (PE).

Packaging

- Fosphenytoin sodium 150 mg/2 mL, 750 mg/10 mL (75 mg/mL or 50 mg/mL PE).

Dosage and administration

- 15 mg PE/kg IV infusion.
- Maximum infusion rate: 100–150 mg PE/min.

Miscellaneous notes

- Better tolerated at site of injection than phenytoin.
- Can be given IV more rapidly than phenytoin.
- Multiply required phenytoin dosage requirement by 1.5 in order to calculate the fosphenytoin dosage.

FRESH FROZEN PLASMA**Overview**

FFP contains the labile and stable components of the coagulation, fibrinolytic and complement systems and the proteins that maintain oncotic pressure and modulate immunity. In addition, fats, carbohydrates and minerals are present in concentrations similar to those in circulation. FFP is indicated for the treatment of single or multiple coagulation deficiencies.

Indications

- Replacement of isolated coagulation factor deficiencies (Factors II, V, VII, IX, X, and XI) when specific component therapy is not available.
- Reversal of warfarin effect.
- As part of a massive blood transfusion protocol.

Dosage and administration

- 15 mL/kg IV.

Haemophilia C

- 15–20 mL/kg FFP IV.
- Then 3–6 mL/kg 12 hourly IV until haemostasis.

Miscellaneous notes

- The volumes required to achieve even modest elevation of circulating factor levels limit the utility of FFP.
- FFP contains all plasma clotting factors, average concentration of 1 U/mL.
- One unit FFP will only raise the factor level by 3–5%.
- FFP is the most appropriate choice in a previously undiagnosed bleeding disorder with no family history to suggest haemophilia type.

FUROSEMIDE

Overview

Furosemide is a potent diuretic that is used as adjunctive therapy for acute pulmonary oedema principally of cardiogenic origin.

Indications

- Acute pulmonary oedema.

Pharmacological action

- Furosemide is a loop diuretic acting primarily by inhibiting electrolyte (Na^+) and fluid reabsorption in the ascending limb of the loop of Henlé.
- In patients with pulmonary oedema, furosemide increases systemic venous capacitance, thereby decreasing left ventricular filling pressure (preload).

Pharmacokinetics

- Onset of action: Within 5 minutes.
- Duration of action: 120 minutes.

Contraindications

- Hypotension, hypovolaemia, hypokalaemia.

Precautions

- Urinary obstruction or retention.
- Very young children and infants are particularly susceptible to dehydration and hypotension.

Packaging

- Furosemide 20 mg/2 mL, 50 mg/5 mL, 250 mg/25 mL (10 mg/mL).

Dosage and administration

- 0.5 mg/kg IV slowly over 1–2 minutes.
- [Dose range 0.5 mg–1 mg/kg.]
- Repeat doses may be administered as needed.

Miscellaneous notes

- Low-dose diuretic therapy is preferable to high doses in acute heart failure.
- Slow administration is essential.
- Either intermittent bolus therapy or furosemide infusions may be used with equal safety and efficacy.

GLUCAGON

Overview

Glucagon may be used to reverse hypoglycaemia or may be used as adjunctive treatment for β -blocker toxicity and for anaphylaxis in patients taking β -blockers.

Indications

- Acute management of symptomatic hypoglycaemia (blood glucose <3.5 mmol/L) if IV dextrose cannot be administered.
- β -blocker toxicity not responding to infusions of adrenaline.
- Anaphylaxis in children on β -blocker treatment.
- Calcium channel blocker OD.

Pharmacological action

- A biosynthetic form of glucagon which releases glucose from the liver by means of glycogenolysis, thereby increasing blood glucose levels.
- It has positive inotropic and positive chronotropic cardiac effects produced by direct adenylate cyclase stimulation, bypassing the β -adrenoceptors. It thus enhances myocardial performance by increasing cAMP concentrations in a manner identical to that of catecholamines, but probably acting via its own receptor.

Pharmacokinetics

- Onset of action: 1 to 5 minutes.
- Duration of action: 15 to 30 minutes.

Contraindications

- Pheochromocytoma.
- History of allergy to beef or porcine protein.

Precautions

- Glucagon for hypoglycaemia is not effective in patients with marked depletion of liver glycogen stores, as in starvation, adrenal insufficiency, or chronic hypoglycaemia.

Packaging

- 1 mg/vial freeze-dried glucagon plus syringe containing 1 mL WFI.
- Reconstitute with provided solution: Inject 1 mL WFI into vial, shake to dissolve, then draw up solution. Do not mix with NS.

Dosage and administration

- 0.05 mg/kg IV slowly.
- β -blocker toxicity with severe cardiovascular instability 0.05–0.15 mg/kg.
- Followed by an infusion of 0.05–0.1 mg/kg per hour.

Miscellaneous notes

- The effects of glucagon wear off rapidly, demanding very large doses to treat β -blocker toxicity. This indication is based only on case-report evidence.

GLUCOSE 50% (D50W)**Overview**

Don't Ever Forget Glucose (DEFG) is an important adage in managing paediatric emergencies.

Indications

- Acute management of symptomatic hypoglycaemia (glucose <3.5 mmol/L and patient is clinically symptomatic; <2.2 mmol/L in neonates).
- Decreased level of consciousness of unknown cause, with suspicion of associated hypoglycaemia.
- Adjunctive therapy in hyperkalaemia (together with insulin).

Pharmacological action

- Glucose is immediately available as a source of energy.

Contraindications

- There are no absolute contraindications in the presence of true symptomatic hypoglycaemia.
- Do not routinely administer immediately after birth.

Precautions

- D50W is acidic and irritant to tissue: dilute it down to 25% and preferably down to 12.5%.
- Limit the use of glucose to symptomatic hypoglycaemic patients.
- Never combine glucose and sodium bicarbonate in the same infusion.

Packaging

- D50W 20 mL and 50 mL ampoules of a 50% solution (0.5g/mL).
- 50 mL mini-bag containing a 50% solution.

Dosage and administration

- 1 mL/kg of a 50% solution which is then diluted to a 12.5% solution with WFI (to prepare a 12.5% solution, mix 1 mL D50W mixed with 3 mL WFI).
- Repeat every 5 minutes should blood glucose remain <3.5 mmol/L.

Miscellaneous notes

- If blood glucose remains <3.5 mmol/L after 3 doses, reassess patient, equipment and administration technique.
- Treat the patient and not the test result.

GLYCOPYRROLATE**Overview**

Glycopyrrolate is an anticholinergic, antimuscarinic agent with similar actions to atropine, although longer acting.

Indications

- It is used together with neostigmine for reversal of non-depolarizing neuromuscular blocking drugs to protect against the peripheral muscarinic effects of neostigmine.
- To dry secretions, especially as an antisialagogue.
- To treat symptomatic bradycardia.

Pharmacological action

- Glycopyrrolate inhibits the action of acetylcholine on structures innervated by postganglionic cholinergic nerves. These peripheral cholinergic receptors are present in cardiac muscle, the SA node, the AV node and exocrine glands.

Pharmacokinetics

- Onset of action: 1 minute.
- Duration of action: 2 to 3 hours.

Precautions

- Glaucoma, asthma, dysrhythmias, paralytic ileus, pyloric stenosis, cardiovascular disease, myasthenia gravis.

Packaging

- Glycopyrrolate bromide 0.2 mg/1 mL, 0.6 mg/3 mL (0.2 mg/mL).

Dosage and administration

- 0.01 mg/kg IV with 0.05 mg/kg neostigmine.
- Glycopyrrolate may be administered simultaneously from the same syringe with the anticholinesterase. Greater cardiovascular stability results from co-administration.

Miscellaneous notes

- Can be used as an alternative to atropine for the management of organophosphate poisoning.
- Does not cross the blood-brain barrier and so has fewer CNS side effects than atropine.

HYDROCORTISONE

See CORTICOSTEROID.

INSULIN (RAPID-ACTING/SOLUBLE)**Overview**

Biosynthetic form of the insulin hormone.

Indications

- Diabetes mellitus.
- Hyperglycaemia.
- Hyperkalaemia.

Pharmacological action

- Anabolic hormone which leads to the uptake of glucose into cells and promotion of glycogen formation.

Pharmacokinetics

- Onset of action: 20–30 minutes.
- Duration of action: 5–7 hours.

Contraindications

- Hypoglycaemia.
- Hypokalaemia.

Precautions

- Some studies show that insulin can adhere to the IV tubing and thus decrease the dose that gets to the patient. The IV tubing can be primed with an insulin solution of 5 IU/mL for 20 minutes prior to starting the infusion in order to impregnate the tubing with insulin and ensure immediate delivery of insulin to the patient.

Packaging

- 100 IU/mL vials or prefilled syringes.

Dosage and administration

- 0.1 IU/kg IV.
- This dose may be repeated if required, after rechecking glucose levels.

Miscellaneous notes

- Must be administered IV in an emergency situation.

KETAMINE**Overview**

Ketamine is an induction agent and a commonly used agent for PSA in children.

Indications

- RSI induction agent especially for septic, hypovolaemic and hypotensive patients or children with bronchospasm.
- Procedural sedation and analgesia.

Pharmacological action

- Ketamine is a phencyclidine (PCP) derivative, providing significant analgesia, anaesthesia and some amnesia, with preservation of central respiratory drive.
- In patients who are not catecholamine depleted, ketamine releases catecholamines and stimulates the sympathetic nervous system, and thus increases heart rate and BP.
- Ketamine directly stimulates the CNS, increasing cerebral metabolism, oxygen demand and blood flow. This may increase ICP in patients with head injury, although cerebral perfusion pressure is maintained.
- Ketamine causes bronchodilation, directly relaxing bronchial smooth muscle.

Pharmacokinetics

- Onset of action: 45–60 seconds.
- Duration of action: 10–20 minutes.

Contraindications

- Cardiovascular disease.
- Hypertension.

Precautions

- Ketamine may cause hypotension in catecholamine depleted patients – limit doses to <1.5 mg/kg in these children.

Packaging

- Ketamine hydrochloride 10 mg/mL, 50 mg/mL, 100 mg/mL in a 20 mL vial.

Dosage and administration

Induction

- 2 mg/kg IV slowly.
- [Dose range 1–3 mg/kg.]

PSA

- 1 mg/kg IV titrated to effect or 4 mg/kg IM.

Miscellaneous notes

- Routine premedication with atropine is not required.
- Ketamine is a powerful analgesic agent and is underused in this capacity.

KETOFOL

Overview

Ketofol is a mixture of propofol and ketamine that can be used for procedural sedation or RSI.

Indications

- Procedural sedation and analgesia.
- Rapid sequence intubation.

Pharmacological action

- Sedative and analgesic combination employing the positive features of each drug to counteract the negative features of the other drug.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 5–10 minutes.

Contraindications

- Contraindications to either ketamine or propofol (see relevant sections).

Precautions

- Respiratory depression may occur – readiness for airway management and assisted ventilation is essential.

Packaging

- PSA – ketofol can be concocted in a 1:1 mixture using ketamine 10 mg/mL and propofol 10 mg/mL (0.075 mL/kg of each drug).
- RSI – ketofol can be concocted in a 1:2 mixture using ketamine 10 mg/mL and propofol 10 mg/mL (0.05 mL/kg of ketamine and 0.1 mL/kg of propofol).
- They can be mixed in a single syringe.

Dosage and administration**PSA**

- Ketamine at 0.75 mg/kg and propofol at 0.75 mg/kg.

RSI

- Ketamine at 0.5 mg/kg and propofol at 1 mg/kg.

Miscellaneous notes

- Although useful, ketofol has still to be studied under a wider range of usages and clinical conditions and it should be used with care.

KETOROLAC**Overview**

Ketorolac is an anti-inflammatory drug that has been widely studied in children, principally for the management of postoperative pain.

Indication

- Short-term moderate pain relief for minor trauma, hollow-viscus pain and other painful conditions.

Pharmacological action

- Ketorolac has the same mechanism of action as any NSAID – blocking the action of cyclooxygenase with a resultant inhibition of prostaglandin synthesis.

Pharmacokinetics

- Onset of action: 5–10 minutes.
- Duration of action: 6–8 hours.

Contraindications

- Active peptic ulcer disease; gastrointestinal bleeding; suspected or confirmed cerebrovascular bleeding, haemorrhagic diathesis including coagulation disorders, NSAID cross sensitivity, moderate to severe renal impairment, patients at risk of renal failure due to volume depletion or dehydration.

Precautions

- Ketorolac may cause significant GIT side effects or renal dysfunction.
- Avoid in major trauma.

Packaging

- Ketorolac tromethamine 10 mg/1 mL, 30 mg/1 mL.

Dosage and administration

- 0.5 mg/kg IV slowly.
- This dose should not be repeated in the ED.

Miscellaneous notes

- Ketorolac is one of the few injectable NSAIDs that can be used in children but should be used only when it is definitely safe to do so.

LABETALOL

Overview

Intravenous combined α - and non-cardioselective β -adrenergic receptor blocker used for hypertensive emergencies.

Indications

- Hypertensive emergency.

Pharmacological action

- α - and non-cardioselective β -adrenergic receptor blocker.
- Ratio of α : β activity 1:7.

Pharmacokinetics

- Onset of action: 2–5 minutes.
- Duration of action: 4–6 hours.

Contraindications

- 2nd or 3rd degree AV block.
- Severe bronchospasm.
- Cardiogenic shock.

Precautions

- Use with caution in children with asthma.
- Use with caution in children with cardiac failure.

Packaging

- Labetalol 100 mg/20 mL (5 mg/mL).

Dosage and administration

- 0.2 mg/kg IV bolus (maximum 40 mg).
- [Dose range 0.2–1 mg/kg.]
- This dose may be repeated after 5–10 minutes if required.
- Infusion: 0.25–3.0 mg/kg/hour.

Miscellaneous notes

- Even though the patient is hypertensive, most are intravascularly depleted. It is therefore prudent to give a judicious fluid bolus prior to the administration of labetalol.

LIDOCAINE

Overview

Lidocaine is a second-line agent for the management of ventricular fibrillation and ventricular tachycardia. It may also be used prior to RSI in head-injured children to blunt the autonomic response to intubation and limit the increase in intracranial pressure.

Indications

- Shock resistant VF – only if amiodarone unavailable or contraindicated.
- VT – only if amiodarone unavailable or contraindicated.

- Control of haemodynamically compromising PVCs or complex ventricular ectopy.
- Torsades de pointes (evidence of long QTc) – use lidocaine only if magnesium sulphate (the primary drug for torsades) is not effective or is unavailable.
- Premedication for intubation of patients with head injury, stroke, hypertensive encephalopathy or raised ICP.

Pharmacological action

- Lidocaine acts as a membrane stabilizer and results in the inhibition of fast sodium channels, termination of ectopic beats, shortened action potential duration, decreased myocardial excitability, protection of myocardium against arrhythmias
- In emergency endotracheal intubation, lidocaine administration prior to intubation may mitigate the catecholamine effects of pharyngeal/laryngeal manipulation in patients where raised ICP or increased BP may be detrimental.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 10–20 minutes.

Contraindications

- Prior use of amiodarone.
- Heart blocks (2° or 3° AV blocks).
- Bradycardia.
- Hypotension not due to ventricular arrhythmia.
- Severe SA node dysfunction.
- Accelerated idioventricular rhythm.

Precautions

- Caution must be exercised with subsequent doses in impaired liver function and left ventricular failure.
- Discontinue immediately if signs of toxicity occur.

Packaging

- Lidocaine hydrochloride 50 mg/5 mL (1%), 100 mg/5 mL (2%), 500 mg/5 mL (10%) and 1000 mg/5 mL (20%).

Dosage and administration

Ventricular tachyarrhythmias

- 1 mg/kg IV slowly (maximum cumulative dose 3 mg/kg).
- Repeat 0.5 mg/kg every 5 minutes if needed.
- Follow with maintenance infusion of 20–50 µg/kg/min upon restoration of a stable rhythm.
- Note: administration of bolus doses must be terminated when either:
 - A maximum of 3 mg/kg has been administered, or
 - The blood pressure drops by >10%, or
 - Ventricular arrhythmias cease, or
 - Signs of toxicity develop.

Premedication for RSI (raised ICP)

- 1.5 mg/kg IV bolus at least 3 minutes before intubation.

Miscellaneous notes

- Electrical cardioversion is imperative for unstable tachyarrhythmias.
- The efficacy of lidocaine as a premedication prior to RSI in patients with raised ICP is controversial.

LORAZEPAM

Overview

Lorazepam may be used to abort status epilepticus; it has an anticonvulsant effect of longer duration than diazepam.

Indications

- First-line anticonvulsive therapy for seizures.

Pharmacological action

- It has anxiolytic, sedative, sleep-inducing, and anticonvulsant properties.
- Lorazepam is a benzodiazepine with very similar effects to diazepam. It appears to suppress the propagation of seizure activity produced by foci in the cortex, thalamus and limbic areas of the CNS.
- Lorazepam has longer CNS activity than diazepam. It is therefore preferable to diazepam as a first-line anticonvulsant in status epilepticus.

Pharmacokinetics

- Onset of action: 3 minutes.
- Duration of action: 12–24 hours.

Contraindications

- Known hypersensitivity or allergy to benzodiazepines or to the vehicle (polyethylene glycol, propylene glycol and benzyl alcohol).
- In a patient with persistent convulsions, there are no other absolute contraindications, but due to its ability to cause respiratory depression, it must not be used if the patient cannot be artificially ventilated should the need arise.

Precautions

- See DIAZEPAM.

Packaging

- Lorazepam 4 mg/1 mL.

Dosage and administration

- 0.1 mg/kg IV slowly (maximum single dose of 4 mg).
- Repeat after 10 minutes if necessary.
- Titrate to effect (use the lowest effective dosage).

Miscellaneous notes

- To facilitate withdrawal of solution from the ampoule, a diluent of 1 mL of WFI for injection or NS may be added to the ampoule immediately before further dilution.
- Only administer during active convulsions and only via the IV/IO route.

MAGNESIUM SULPHATE

Overview

Magnesium may be used to treat acute severe asthma, some forms of ventricular arrhythmias and hypomagnesaemia.

Indications

- Recommended for use in cardiac arrest if torsades de pointes or suspected hypomagnesaemia is present.
- Life-threatening ventricular dysrhythmias due to digoxin toxicity.
- Acute severe asthma unresponsive to conventional therapy.

Pharmacological action

- Magnesium plays an important role in stabilizing excitable membranes.
- Magnesium causes smooth muscle relaxation in the airways and blood vessels.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 2 hours.

Contraindications

- Bradycardia.

Precautions

- A fall in blood pressure may be associated with rapid administration.
- Use with caution if renal failure is present.
- Respiratory depression may develop in magnesium toxicity.
- Parenteral therapy should be undertaken with caution, particularly in patients with cardiac conduction defects or receiving digoxin therapy.

Packaging

- Magnesium sulphate 1 g/2 mL (500 mg/mL).

Dosage and administration

- 40 mg/kg IV over 10 to 20 minutes (maximum dose 2 g).
- [Dose range of 25 to 50 mg/kg.]
- May repeat one dose after 2 hours in severe asthma.
- Administer STAT if patient is in cardiac arrest and magnesium is indicated but routine use of magnesium in cardiac arrest has not been shown to be helpful.

Miscellaneous notes

- 40 mg/kg is the dose that has been best studied in asthma.
- A decrease in deep tendon reflexes is one of the earliest signs of magnesium toxicity.
- Administer with continuous careful monitoring.

MAINTENANCE FLUIDS**Miscellaneous notes**

- Normal maintenance fluid administration should be with a specific formulation that is appropriate for the age and clinical condition of the patient. Intravenous fluid therapy in children has a surprisingly high morbidity, with hyponatraemia at the fore, and should be used appropriately and carefully. The formula for calculating the estimated fluid requirement is:
- 0–10 kg: 4 mL/kg/hour.
- 11–20 kg: 40 mL/hour + 2 mL/kg/hour for each kg over 10 kg.
- 20–30 kg: 60 mL/hour + 1 mL/kg/hour for each kg over 20 kg.

MANNITOL**Overview**

Mannitol is an osmotic diuretic which may be used to decrease intracranial pressure in patients with signs of tentorial herniation. It can also be used as an osmotic diuretic with myoglobinaemia.

Indications

- To reduce elevated ICP, cerebral oedema or increased intraocular pressure.

Pharmacological action

- Decreases intracranial pressure transiently in patients with cerebral oedema.
- Reduces intraocular pressure.
- May prevent the development of acute tubular necrosis in acute kidney injury.
- Mannitol is filtered at the glomerulus but it is not reabsorbed in the distal nephron and thus prevents reabsorption of water, sodium and chloride.

Pharmacokinetics

- Onset of action: 15 minutes.
- Duration of action: 3–8 hours.

Precautions

- Serum osmolality should not exceed 320 mosm/L because of the risk of renal failure if it exceeds this level.

Packaging

- Mannitol 12.5 g/50 mL (25% m/v).
- Mannitol may be available in 5%, 10%, 15%, 20% and 25% solutions.

Dosage and administration

- 1 g/kg over 30–60 minutes.
- [Dose range 0.25–2 g/kg.]
- Repeat doses can be given every 4–6 hours as required.

Miscellaneous notes

- Mannitol may rapidly cause intravascular volume depletion in infants and children.

METHYLENE BLUE**Overview**

Methylene blue is used to treat acute, symptomatic, acquired methaemoglobinaemia.

Indication

- Antidote for toxic methaemoglobinaemia.

Pharmacological action

- Reduces methaemoglobin to haemoglobin.
- Compounds that induce methaemoglobin include nitrites, nitrates, aniline, ceftriaxone, dapsone, primaquine and local anaesthetic agents (especially prilocaine).
- Treatment is indicated when methaemoglobin levels exceed 30%.

Pharmacokinetics

- Onset of action: 30–60 minutes.
- Duration of action: 2–3 hours.

Contraindications

- Causes haemolysis in G6PD-deficient patients.

Precautions

- Large doses or too rapid administration may paradoxically cause methaemoglobinaemia.

Packaging

- Methylthioninium chloride 100 mg/10 mL (10 mg/mL).

Dosage and administration

- 1 mg/kg as slow IV infusion over 5 minutes.
- Dose may be repeated in 1 hour.

Miscellaneous notes

- Methaemoglobinaemia may be caused as a result of medications, toxins or oxidising agents used in the treatment of poisoning.
- Effects may only be noted after 1 hour – supportive treatment should be actively instituted without delay.

METHYLPREDNISOLONE

See CORTICOSTEROIDS section.

MIDAZOLAM**Overview**

Midazolam is a short-acting benzodiazepine that is used for sedation and for the termination of status epilepticus.

Indications

- Sedation.
- Anticonvulsive therapy – midazolam is not considered ideal first-line therapy but may be used if lorazepam is not available. It is particularly useful if IM injection is required.

Pharmacological action

- Midazolam is a benzodiazepine acting on the central nervous system to potentiate the GABA-mediated neural inhibition.
- It has anxiolytic, sedative, sleep-inducing, and anticonvulsant properties and causes anterograde and retrograde amnesia.
- It is water-soluble, allowing mixture and infusion, as opposed to diazepam, which has an oily base.

Pharmacokinetics

- Onset of action: 1–3 minutes.
- Duration of action: 30 minutes.

Contraindications

- Known hypersensitivity or allergy to benzodiazepines.

Precautions

- Midazolam has no antipsychotic effects and may create paradoxical agitation.
- Rule out reversible causes of convulsions such as hypoglycaemia.

Packaging

- Midazolam 5 mg/5 mL (1 mg/mL), 15 mg/3 mL (5 mg/mL), 50 mg/10 mL (5 mg/mL).

Dosage and administration

- 0.2 mg/kg IM.
- 0.1 mg/kg IV slowly.
- Titrate to effect: use the minimum effective dosage.

Miscellaneous notes

- IV benzodiazepine treatment for status epilepticus is preferable to any other route but IM midazolam is superior to rectal diazepam.
- Although midazolam is often used for RSI it should be regarded as a drug of last resort: ketamine, etomidate, propofol and thiopentone are better agents.
- Midazolam is 2–3 times more potent than diazepam.

MORPHINE

Overview

Morphine is a potent long-acting opioid analgesic agent.

Indications

- Severe pain requiring parenteral analgesia.

Pharmacological action

- Morphine is a centrally-acting analgesic that binds to specific opioid receptors in the brain and spinal cord, resulting in an increase in the pain threshold.
- Reduces myocardial oxygen consumption and workload.

Pharmacokinetics

- Onset of action: 5–20 minutes.
- Duration of action: 4–6 hours.

Contraindications

- Known hypersensitivity or allergies to opioids.

Precautions

- Patients at risk for respiratory depression.
- The effects of opioids may be enhanced by alcohol, barbiturates, benzodiazepines, opioids and other depressants acting on the CNS.

Packaging

- Morphine sulphate 10 mg/1 mL, 15 mg/1 mL.

Dosage and administration

- 0.1 mg/kg IV slowly.
- Titrate to effect with repeat doses every 5 to 15 minutes until pain relief achieved (use minimum effective dosage).

Miscellaneous notes

- Morphine should not be used for PSA as the onset and duration of action are not suitable.
- The onset of action of IV morphine is very variable – patients with severe pain should ideally receive a rapid-acting opioid primarily, followed later by morphine.

N-ACETYLCYSTEINE

Overview

NAC is the specific antidote for paracetamol (acetaminophen) overdose.

Indications

- Paracetamol toxicity or presumed paracetamol overdose.

Pharmacological action

- NAC is a derivative of the amino acid L-cysteine, which is converted to cysteine. It stimulates hepatic glutathione synthesis and thus restores glutathione stores.

Pharmacokinetics

- Onset of action: 30–60 minutes.
- Duration of action: 4–6 hours.

Contraindications

- None.

Precautions

- Asthmatic patients.
- Hypersensitivity reactions: skin rashes and anaphylactic reactions have been reported.
- Hypersensitivity reactions are likely due to histamine release and – if only mild – do not require the NAC to be discontinued. The infusion may rather be temporarily stopped, followed by an IV antihistamine, and restarted at a slower rate.

Packaging

- NAC IV solution 2000 mg/10 mL (200 mg/mL).
- NAC granules 200 mg, 400 mg/sachet.

Dosage and administration**IV**

- 150 mg/kg over 60 minutes, then 50 mg/kg over the next 4 hours, then 100 mg/kg over 16 hours. The volumes of IV fluids should be modified depending on child's age and weight.

PO/via NGT

- 140 mg/kg initially followed by 70 mg/kg 4 hourly for 17 doses. Solutions should be diluted to 5% in water/fruit juice/soft drink. Capsules or powder should be taken with 250 mL of fluid.

Miscellaneous notes

- Both the oral and IV NAC preparations are effective at preventing paracetamol toxicity. Therapy should be commenced in every case where a toxic ingestion is suspected, without waiting for levels.

NALOXONE**Overview**

Naloxone is an opioid antagonist that may be used to reverse respiratory depression and hypotension caused by toxic effects of opioid analgesics.

Indications

- Reversal of respiratory depression or cardiovascular collapse due to acute opioid usage.
- Neonatal respiratory depression secondary to the administration of opioids to the mother in the 4 hours prior to delivery.

Pharmacological action

- Naloxone competes with other opioid drugs for opioid receptors in the central nervous system so as to displace them from their receptor sites.

Pharmacokinetics

- Onset of action: 2 minutes.
- Duration of action: 45 minutes.

Contraindications

- Known hypersensitivity or allergy.
- Infants of opioid-addicted mothers.

Precautions

- In suspected opioid dependence administer IV very slowly to reverse respiratory depression only, as total opioid reversal may precipitate an acute withdrawal syndrome.

- The effect of naloxone is usually shorter than that of many long-acting opioids and therefore repeated doses may have to be given in order to maintain the desired effect. Continued monitoring and observation of such patients is mandatory.
- Provide adequate ventilatory support until respiratory depression has been adequately reversed.

Packaging

- Naloxone hydrochloride 0.04 mg/2 mL (0.02 mg/mL), 0.4 mg/1 mL.

Dosage and administration

Complete opioid reversal

- 0.1 mg/kg IV/IO slowly (maximum dose 2 mg).
- Repeat every 5 minutes to achieve desired effects.
- Naloxone may be administered as a continuous infusion following bolus doses if required – 0.002 to 0.16 mg/kg/hour.

Partial opioid antagonism

- 0.01 mg/kg IV/IO slowly.
- Repeat every 5 minutes to achieve desired effects.

Miscellaneous notes

- In patients without cardiovascular collapse the therapeutic goal is to reverse any respiratory depression in a suspected opioid toxicity, and not to fully awaken such patients, who may become distressed and agitated should acute withdrawal occur.
- Only administer naloxone after adequate oxygenation and ventilation.
- Be cautious of administering it to neonates born from mothers with chronic opioid usage as it may trigger seizures and acute withdrawal symptoms.

NEOSTIGMINE

Overview

Neostigmine reversibly binds to and inactivates acetylcholinesterase and facilitates neuromuscular junction impulse transmission by inhibiting acetylcholine destruction.

Indications

- Reversal of residual non-depolarizing agent neuromuscular blockade.
- Diagnosis and treatment of myasthenia gravis.

Pharmacological action

- It inhibits the action of acetylcholinesterase, thereby prolonging the action of acetylcholine.
- May cause a clinical picture resembling excessive parasympathetic stimulation, including bradycardia and abdominal discomfort.

Pharmacokinetics

- Onset of action: 1–3 minutes.
- Duration of action: 40–60 minutes.

Contraindications

- Intestinal or urinary obstruction.
- Complete neuromuscular blockade without any spontaneous recovery.

Precautions

- Asthma, epilepsy, peptic ulcer, bradycardia, hypotension, recent cardiac dysrhythmias, hypothyroidism.

Packaging

- Neostigmine methylsulphate 0.5 mg/1 mL, 2.5 mg/1 mL.

Dosage and administration

- 0.04 mg/kg IV slowly (maximum dosage 25 mg).
- This dose may be repeated once, but exceeding the maximum dosage may paradoxically prolong the neuromuscular block.

Miscellaneous notes

- Atropine or glycopyrrolate will reduce or eliminate adverse muscarinic effects and should be administered together with neostigmine.
- A substantial amount of recovery must already have occurred before neostigmine can be used to reverse the residual paralysing effects of a non-depolarizing agent (at least 20–30 minutes should have elapsed since the last dose was administered).
- Neostigmine does not penetrate the blood–brain barrier.

OBIDOXIME**Overview**

Obidoxime may be used for organophosphate poisoning after premedication with atropine.

Indications

- Acute moderate to severe organophosphate poisoning, only in conjunction with atropine.

Pharmacological action

- Obidoxime reacts with the organophosphate after it has bound to the acetylcholinesterase. The reaction product is unstable and is rapidly broken down in the body, thus regenerating the acetylcholinesterase. Later this becomes impossible due to 'ageing' which strengthens the phosphorus-enzyme bond. Therefore early administration of oxime therapy is essential.

Pharmacokinetics

- Onset of action: 5–10 minutes
- Duration of action: 40–60 minutes.

Contraindications

- Poisoning by the carbamate carbaryl is an absolute contraindication to oxime use.

Precautions

- Obidoxime should be started about 5 minutes after the first dose of atropine. It is of doubtful value if therapy is initiated later than 24 hours post exposure although it should still be used in severe poisonings with delayed presentation.
- Oximes are probably ineffective for carbamate poisoning but should be administered for mixed poisonings or for serious poisonings by cholinesterase inhibitors of uncertain chemistry.

Packaging

- Obidoxime chloride 250 mg/1 mL.

Dosage and administration

- 4 mg/kg IV over 30 minutes.
- [Dose range 4–8 mg/kg.]
- This dose may be repeated after 2–3 hours if not effective.

Miscellaneous notes

- Atropine remains the mainstay of treatment and should receive priority over oxime treatment.

ONDANSETRON

Overview

The use of ondansetron in the ED is primarily to decrease the number of children who have persistent vomiting as a barrier to ORT, to decrease the number of children requiring IV hydration and to decrease the number of children requiring hospital admission.

Indications

- Ondansetron is useful for the management of nausea and vomiting associated with gastroenteritis.

Pharmacological action

- Ondansetron is a selective serotonin receptor antagonist. The antiemetic activity of the drug is brought about through the inhibition of serotonin receptors present both centrally (chemo-emetic trigger zone) and peripherally in the GIT.

Pharmacokinetics

- Onset of action: 10–30 minutes.
- Duration of action: 2–3 hours.

Contraindications

- Ondansetron may cause prolongation of the QTc interval and should be used with caution in patients with underlying cardiac conduction abnormalities.

Precautions

- Previous hypersensitivity to other serotonin antagonists; hepatic impairment; subacute intestinal obstruction.

Packaging

- Ondansetron hydrochloride dihydrate 4 mg/2 mL, 8 mg/4 mL.

Dosage and administration

- 0.15 mg/kg IV slowly (maximum dose 4 mg).

Miscellaneous notes

- The role of ondansetron in the ED has still to be fully established and it should be used with due consideration of the clinical scenario.

PANCURONIUM

Overview

- Pancuronium is a long-acting non-depolarizing muscle relaxant that may be used to maintain paralysis to facilitate mechanical ventilation.

Indications

- When neuromuscular paralysis is required.

Pharmacological action

- Long-acting non-depolarizing competitive muscle relaxant, with a relatively slow onset of action. Muscle relaxation lasts for about an hour.
- Useful when skeletal muscle relaxation is required in the management of mechanically ventilated patients.

Pharmacokinetics

- Onset of action: 1–2 minutes.
- Duration of action: 35–60 minutes.

Contraindications

- Facilities, equipment and expertise must be immediately available to implement resuscitation and mechanical ventilation until spontaneous respiration is restored.
- Conditions in which tachycardia would be undesirable.
- Hypertension.
- Myasthenia gravis.
- Related neuromuscular blocker hypersensitivity.

Precautions

- Effects are prolonged in renal and hepatic impairment.
- Digoxin interacts with pancuronium to increase the incidence of dysrhythmias.
- Pancuronium is pharmacologically incompatible with thiopentone.
- Patients hypersensitive to bromides may also be sensitive to pancuronium.
- Patients with intra-abdominal haemorrhage may lose the tamponading effect of abdominal muscle tone leading to increased bleeding.

Packaging

- Pancuronium bromide 4 mg/2 mL.

Dosage and administration

- 0.1 mg/kg (maximum dose 4 mg).
- Repeat doses may be administered as required.

Miscellaneous notes

- Can be reversed with a combination of neostigmine 50 µg/kg and glycopyrrolate 10 µg/kg given intravenously. Complete reversal will only be possible after some spontaneous neuromuscular activity returns.
- Pancuronium does cause some histamine release, which is probably clinically insignificant but has a vagolytic action that causes tachycardia.

PANTOPRAZOLE**Overview**

Pantoprazole is a proton pump inhibitor that may be used for serious non-variceal upper GIT bleeds.

Indications

- Upper GIT bleed associated with peptic ulcer disease.

Pharmacological action

- Pantoprazole inhibits the secretion of gastric acid by irreversibly binding to and inhibiting the H^+/K^+ -ATPase enzyme of the parietal cells in the stomach.

Pharmacokinetics

- Onset of action: Within 1 hour.
- Duration of action: >24 hours.

Contraindications

- Gastric malignancy.
- Hypersensitivity.

Precautions

- Liver disease.
- In patients on other drugs metabolized by the liver – decrease pantoprazole dose.

Packaging

- Pantoprazole 40 mg/vial.
- Reconstitute with 2 mL NS and then dilute further before administration.

Dosage and administration

- 2 mg/kg IV over 15 minutes.

Miscellaneous notes

- Solution must be used within 6 hours of reconstitution.
- Incompatible with midazolam – do not give through same IV line.

PARACETAMOL**Overview**

Intravenous paracetamol is an extremely useful analgesic agent for all ages of children.

Indications

- The initial treatment of mild to moderate pain.
- The initial treatment of pyrexia if alternative routes of administration are not available.

Pharmacological action

- Paracetamol inhibits prostaglandin synthesis in the CNS but not peripherally. Possible other mechanisms of action are unknown.

Pharmacokinetics

- Onset of action: 5 minutes.
- Duration of action: 4–6 hours.

Contraindications

- Severe hepatic or renal disease.

Precautions

- IV paracetamol should be infused slowly (over 15–30 minutes), as a rapid infusion may cause hypotension.

Packaging

- Paracetamol 500 mg/50 mL or 1g/100 mL (10 mg/mL).

Dosage and administration

- 15 mg/kg IV infusion (maximum dose 60 mg/kg per 24 hours).

Miscellaneous notes

- IV paracetamol is an excellent general purpose analgesic with opioid-sparing actions.
- The absence of first-pass metabolism for this formulation makes it much more effective than oral or rectal preparations.

PHENOBARBITONE**Overview**

Phenobarbitone IV is used principally to control status epilepticus. The first-line drugs for treatment of status epilepticus are the fast-acting benzodiazepines such as lorazepam, clonazepam or diazepam. If these fail to

control seizures then phenytoin or valproate may be used as the second-line agents, with phenobarbitone an alternative or as a third-tier agent.

Indications

- Status epilepticus.

Pharmacological action

- Phenobarbitone binds to the GABA receptor at a site distant to the GABA-binding site itself and also distant from the benzodiazepine binding site. Barbiturates, like benzodiazepines, potentiate the effect of GABA at this receptor.
- Phenobarbitone also competitively blocks the glutamate receptor in the CNS (glutamate is one of the principal excitatory CNS neurotransmitters).

Pharmacokinetics

- Onset of action: 10–20 minutes.
- Duration of action: 1–3 days.

Contraindications

- Severe hepatic or renal impairment.

Precautions

- IV administration, especially in children with cardiovascular disease, may result in hypotension.
- Extensive drug interactions occur with barbiturates. These are of less significance when phenobarbitone is used in the emergency treatment of status epilepticus.

Packaging

- Phenobarbitone sodium 200 mg/1 mL.

Dosage and administration

- 10 mg/kg IV slowly.
- [Dose range 10–20 mg/kg.]
- Administer at a rate no faster than 100 mg/min until seizures are controlled, or full dose is given.

Miscellaneous notes

- In this book, the dose of phenobarbitone has been presented as 10 mg/kg, which is at the lower end of the dosage spectrum. This dose may therefore be repeated if seizures have not been controlled.

PHENYTOIN

Overview

Intravenous phenytoin is useful as a second-line agent for the management of status epilepticus.

Indications

- Status epilepticus.

Pharmacological action

- Phenytoin acts as an anticonvulsant by inhibiting the flow of sodium ions across cell membranes in the motor cortex during generation of nerve impulses. This stabilizes neuronal membranes and decreases the rapidly repetitive impulses that cause seizure activity.

Pharmacokinetics

- Onset of action: 10–30 minutes.
- Duration of action: 12–24 hours.

Contraindications

- Impaired cardiac function.
- Porphyria.

Precautions

- Severe hypotension, respiratory depression and cardiac dysrhythmias may occur if the drug is injected too rapidly. The injection rate should be slowed if any of these do manifest.

Packaging

- Phenytoin sodium 250 mg/5 mL (50 mg/mL).

Dosage and administration

- 20 mg/kg IV loading dose.
- [Dose range 15–25 mg/kg.]
- Administer at a rate of 1–3 mg/kg/minute (maximum rate 50 mg/min).
- A small volume infusion in NS should be used.

Miscellaneous notes

- Children need continuous ECG and BP monitoring while administering phenytoin to ensure early detection of serious deleterious effects.

PLATELETS**Miscellaneous notes**

- The early use of FFP and platelets is recommended as part of a massive transfusion protocol.
- These agents should be administered early and in volumes at the upper end of dosage ranges.
- Once 40 mL/kg blood has been administered to children with acute haemorrhage, or it is seen that it will be required, then this should trigger the initiation of the massive transfusion protocol.

POTASSIUM FOR SEVERE SYMPTOMATIC HYPOKALAEMIA**Overview**

Profound hypokalaemia is a potentially life-threatening condition that requires intravenous potassium replacement. The danger of IV administration of potassium has to be balanced against the danger of hypokalaemia, so only severe or symptomatic hypokalaemia should be treated in this way.

Indications

- Cardiac arrest (PEA) associated with hypokalaemia.
- Symptomatic hypokalaemia.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: Variable.

Contraindications

- There are no contraindications in life-threatening hypokalaemia.

Precautions

- Serum potassium levels do not necessarily reflect total body potassium levels.
- Alkalosis may cause a transient drop in serum potassium which will correct with the return of the pH to normal.

- Continuous cardiac monitoring is important for children receiving IV potassium.
- Administer potassium cautiously in patients with renal dysfunction.

Packaging

- Potassium chloride 20 mmol/10 mL (2 mmol/mL or 15% solution).

Dosage and administration

- Serum K^+ 3.0 to 3.5 – add potassium to maintenance fluids (20 mmol/L).
- Serum K^+ 2.5 to 3.0 – add potassium to maintenance fluids (40 mmol/L).
- Serum K^+ <2.5 with ECG changes or respiratory compromise from muscle weakness – use volume indicated in drug dosing tables as an IV infusion over 30 minutes and add potassium to maintenance fluids (40 mmol/L).
- Serum K^+ <2.5 with cardiac arrest – use volume indicated in drug dosing tables as an IV push over 1 to 2 minutes and repeat if needed.

Miscellaneous notes

- Use oral replacement of potassium whenever possible.
- If hypokalaemia is refractory to treatment then consider supplementing magnesium, as low magnesium may increase potassium loss.
- If different preparations are available then give potassium chloride for children that are alkalotic and potassium bicarbonate for children that are acidotic.
- Do not exceed 3 mmol/kg per day of IV replacement.
- Recheck serum potassium and pH frequently during IV potassium administration.

PRALIDOXIME

Overview

Pralidoxime chloride is a cholinesterase reactivator and is used as an adjunct to atropine in moderate or severe organophosphate poisoning. It improves muscle tone within 30 minutes of administration.

Indications

- As an adjunct to atropine in the treatment of poisoning by organophosphate insecticide or some nerve agents.

Pharmacological action

- Pralidoxime reactivates cholinesterase outside the CNS which has been inactivated by phosphorylation due to organophosphate exposure. This results in destruction of acetylcholine at the neuromuscular junction, thus relieving muscle paralysis.

Pharmacokinetics

- Onset of action: 10–15 minutes.
- Duration of action: 1 hour.

Contraindications

- Poisoning with the specific carbamate carbaryl.
- Treatment of organophosphate compounds without anticholinesterase activity.

Precautions

- Potentially fatal complications may occur with rapid administration – tachycardia, laryngospasm and muscle rigidity.
- Large doses cause neuromuscular blockade.

- Potentially fatal drug interaction with certain carbamate pesticides (carbaryl), which potentiates toxicity.

Packaging

- Pralidoxime chloride 1 g/vial – dilute with 20 mL WFI.

Dosage and administration

- 25 mg/kg IV over 15 to 30 minutes.
- The dose may be repeated after one hour, and then at 8–12 hour intervals if muscle weakness persists.
- Alternatively 25 mg/kg IV over 15 to 30 minutes, followed by 8 mg/kg/hour as an infusion.

Miscellaneous notes

- Administer atropine IV until patient shows signs of atropinization with decreased secretions. Maintain atropine infusion for at least 48 hours. Once atropine effects are observed, administer pralidoxime.
- Note: loading dose may be administered more rapidly IV, if pulmonary oedema is present, but over at least 5 minutes (diluted to a concentration of 50 mg/mL with WFI).

PROCAINAMIDE

Overview

Procainamide is an antiarrhythmic agent that prolongs the duration of the action potential in cardiac tissue and is used for treating atrial flutter, atrial fibrillation, SVTs and for the suppression of VT. Its potential toxicity, side effects and the availability of better agents have diminished its use.

Indications

- Regular narrow complex tachycardia with pulses and poor perfusion unresponsive to vagal manoeuvres, adenosine or synchronized cardioversion.
- Regular broad complex tachycardia with pulse.
- Known WPW with supraventricular tachycardia and rapid ventricular rate.

Pharmacological action

- Procainamide is a sodium and potassium channel blocker that prolongs the action potential duration. It depresses excitability of the myocardium, slows conduction velocity through atria, bundle of His, and ventricles. It increases the refractory period by slowing phase 0 of the cardiac action potential.

Pharmacokinetics

- Onset of action: 5–10 minutes.
- Duration of action: 1 hour.

Contraindications

- Complete heart block or second-degree AV block.
- Torsades de pointes.

Precautions

- Consult with an expert when considering the use of this agent.
- Routine use in tandem with amiodarone (or other QTc prolonging drugs) is not recommended.
- Risk of hypotension and negative inotropic effects increase with rapid administration. BP and ECG must be continuously monitored, noting the QTc interval (normal $\leq 50\%$ of the R-R interval).

- Procainamide paradoxically shortens the effective refractory period of the AV node, increasing AV nodal conduction. It may thus increase the heart rate when treating atrial fibrillation or ectopic atrial tachycardia.

Packaging

- Procainamide hydrochloride 1 g/2 mL (500 mg/mL), 1 g/10 mL (100 mg/mL).

Dosage and administration

- 15 mg/kg IV/IO over 30–60 minutes, preferably in 5 mg/kg increments until the desired effect has been achieved with the minimum dose.
- Maximum infusion rate of 50 mg/minute.

Miscellaneous notes

- Must be given slowly to avoid toxicity which may cause heart block, myocardial depression and prolongation of the QTc interval, which predisposes to torsades de pointes.

PROMETHAZINE

Overview

Promethazine is a potent non-selective antihistamine.

Indications

- Acute anaphylaxis or severe allergy.

Pharmacological action

- Promethazine is a sedating antihistamine with considerable activity at other receptor sites: it combines potent H₁-antagonism with antiemetic, anticholinergic, and some hypotensive effects.

Pharmacokinetics

- Onset of action: 3–5 minutes.
- Duration of action: 12 hours.

Contraindications

- Promethazine must be used with extreme caution in children under 2 years of age because of the risk of severe respiratory depression, especially if other agents have been given which might depress respiration. These side effects are extremely rare and the risks and benefits need to be considered. Use for life-threatening emergencies in the ED may be considered if alternative agents are not available.

Precautions

- Epilepsy.
- Cardiovascular disease.
- Asthma.
- Narrow-angle glaucoma.

Packaging

- Promethazine hydrochloride 50 mg/2 mL (25 mg/mL).

Dosage and administration

- 0.5 mg/kg as a slow IV infusion.

Miscellaneous notes

- Promethazine should only be used for allergy or anaphylaxis and not for sedation because of the risk of side effects.
- Intravenous usage should be under monitored conditions, with caution and for good reason in children under the age of 2 years.

PROPOFOL

Overview

In the ED, propofol may be used as an induction agent for RSI, as a sedative for PSA and as part of the management of status epilepticus.

Indications

- As an induction agent for RSI.
- As a sedative agent for procedural sedation.
- As part of the third- or fourth-line management of status epilepticus as an infusion.

Pharmacological action

- IV sedative/hypnotic agent that works via the GABA receptors.
- Rapid onset and short clinical duration.
- Produces a dose-dependent decrease in level of consciousness.
- Decreases airway reflexes to intubation in a dose-dependent manner.
- Lack of residual sedation upon recovery.
- No histamine release.
- Reduces intraocular and intracranial pressure.
- Low incidence of excitatory effects.
- Extravasation is not associated with local necrosis.
- No analgesic effects.
- Antiemetic.

Pharmacokinetics

- Onset of action: 40 seconds.
- Duration of action: 3 to 5 minutes.

Contraindications

- Allergy to soya or egg.
- Hypovolaemia.

Precautions

- Children with significant comorbidities or debilitation.

Packaging

- Propofol 10 mg/mL (1% in 20 mL ampoules and 50 mL, 100 mL vials), 20 mg/mL (2% in 50 mL vial).

Dosage and administration

RSI

- 3 mg/kg IV – dose adjusted for clinical scenario.
- [Dose range 1–3 mg/kg.]

Procedural sedation

- 1 mg/kg titrated to appropriate clinical effect.

Infusion for status epilepticus

- 2–3 mg/kg as initial dose followed by an infusion of 1 mg/kg/hour.

Miscellaneous notes

- Hypotension and transient apnoea may occur during induction or with deep sedation – depending on dose, age, and other agents used.
- Local pain during IV injection – may be minimized by using larger veins or by adding lidocaine immediately preceding propofol injection or mixed in the syringe – pain on injection is improved by mixing the drug with a small amount (0.25 mg/kg) of intravenous lidocaine.
- Long-term use of continuous infusion is potentially harmful in children because of the risk of propofol infusion syndrome, which may be fatal.

PYRIDOSTIGMINE

Overview

Pyridostigmine is a parasymphathomimetic cholinergic agent mediated by anticholinesterase effects, with a slightly longer duration of action than neostigmine.

Indications

- Reversal of non-depolarizing neuromuscular blockade in combination with glycopyrrolate.
- Management of myasthenia gravis.
- Prophylaxis for Soman exposure.

Pharmacological action

- Reversible inhibitor of acetylcholinesterase, thereby increasing cholinergic stimulation at the neuromuscular junction.
- It also has a direct cholinomimetic effect on skeletal muscle and possibly on autonomic ganglion cells and neurons of the CNS.

Pharmacokinetics

- Onset of action: 20 minutes.
- Duration of action: 3–6 hours.

Contraindications

- Intestinal or urinary obstruction.

Precautions

- May prolong the duration of action of suxamethonium.

Packaging

- Pyridostigmine bromide 1 mg/1 mL, 10 mg/2 mL (5 mg/mL).

Dosage and administration

- 0.05 mg/kg IV slowly.

Miscellaneous notes

- Slower onset and longer duration of action than neostigmine.
- Fewer gastrointestinal side effects than neostigmine.

RANITIDINE

Overview

Ranitidine acts by blocking histamine from binding to H₂-receptors.

Indications

- Anaphylaxis.
- Peptic ulcer disease.
- Zollinger–Ellison syndrome.

Pharmacological action

- It increases antihistamine antagonism, which might be useful adjunctive therapy in anaphylaxis.
- It competitively blocks histamine's action on the H₂-receptor, thereby decreasing gastric acid secretion and reducing pepsin output.

Pharmacokinetics

- Onset of action: 15 minutes.
- Duration of action: 24 hours.

Contraindications

- Porphyria.

Precautions

- Reduce dosage if patient has impaired renal function.

Packaging

- 50 mg/2 mL (25 mg/mL).

Dosage and administration

- 1 mg/kg IV as slow infusion.

Miscellaneous notes

- Ranitidine is not as effective as proton pump inhibitors when used for peptic ulcer prophylaxis or treatment.

REHYDRATION FLUID THERAPY**Miscellaneous notes**

- Oral rehydration is preferred to IV rehydration whenever feasible because it is safer.
- Children with severe dehydration or those that require resuscitation should have IV/IO fluids.
- IV fluid replacement should always be calculated to run over at least 24 hours to minimize the side effects associated with IV rehydration (especially rapid changes in Na^+ concentration).
- The formula used to estimate fluid replacement is:

$$\text{Volume of fluid (mL/day)} = \% \text{ dehydration} \times \text{weight (kg)} \times 10$$

- This fluid is infused in addition to normal maintenance requirements. This formula provides only an estimation of the starting point for fluid requirements, which should be adjusted according to clinical condition on a regular basis.
- Avoid hypotonic fluids for fluid replacement but rather use a balanced salt solution or NS rather than 0.45% saline.

ROCURONIUM**Overview**

Rocuronium is a non-depolarizing muscle relaxant that can be used for RSI.

Indications

- Neuromuscular blocking agent for RSI if suxamethonium is contraindicated.
- Maintenance of postintubation paralysis.

Pharmacological action

- Rocuronium competes with acetylcholine at cholinergic (nicotinic) receptors at the neuromuscular junction.
- Effects can be reversed by anticholinesterases, which allow the accumulation of acetylcholine at the receptor sites, which then displaces the competitive muscle relaxant.

Pharmacokinetics

- Onset of action: 60 seconds.
- Duration of action: 45–60 minutes.

Contraindications

- Predicted inability to either ventilate or oxygenate the patient.

Precautions

- Rocuronium may be pharmacologically incompatible with thiopentone.
- If previous anaphylactic reactions to other neuromuscular blockers are reported, beware of cross-reactivity when using rocuronium.
- Neuromuscular blocking effect increased and duration prolonged in hypothermia.

Packaging

- Rocuronium bromide 20 mg/2 mL, 50 mg/5 mL (10 mg/mL).

Dosage and administration

- 1 mg/kg IV push.

Miscellaneous notes

- Ensure that an adequate dose is given for RSI (1 mg/kg) and not the dose for elective sequence induction (0.6 mg/kg).
- Can be reversed with a combination of neostigmine 50 µg/kg and glycopyrrolate 10 µg/kg given intravenously. Complete reversal will only be possible after some spontaneous neuromuscular activity returns.

SALBUTAMOL**Overview**

Although only the intravenous form of this drug is presented in this book, the mainstay of delivery remains nebulization for the treatment of acute bronchospasm.

Indications

- Acute bronchospasm.
- Life-threatening hyperkalaemia.

Pharmacological action

- Salbutamol (albuterol) is a selective β_2 -stimulant acting on the β_2 receptors in the lungs, causing bronchodilation through relaxation of bronchial smooth muscle.
- A drop in serum K^+ is produced by shifting of K^+ from the extracellular to the intracellular fluid compartment. Total body potassium remains unchanged.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 30 minutes.

Contraindications

- Known hypersensitivity or allergy to β_2 stimulants (which does occur!)
- Neonates.

Precautions

- Intravenous β_2 -stimulants should be used with caution in patients with cardiovascular disease, hyperthyroidism and diabetes mellitus.
- Monitor plasma potassium levels as there is a risk of hypokalaemia.
- Monitor blood glucose in diabetics.

Packaging

- Salbutamol 0.5 mg/1 mL or 5 mg/5 mL (1 mg/mL).

Dosage and administration

- 5 µg/kg diluted, IV slowly over 10 minutes.

Miscellaneous notes

- Salbutamol and ipratropium bromide delivered via nebulizer or multi-dose inhaler remains the treatment of choice for acute exacerbations of asthma.
- Intravenous salbutamol is not a first-line treatment but may be useful under certain circumstances.
- The large volumes required to deliver appropriate doses as an infusion make this an awkward drug to use.
- SQ or IM adrenaline is a better option as an initial therapy in life-threatening asthma.

SODIUM BICARBONATE 8.5%**Overview**

Intravenous sodium bicarbonate increases plasma bicarbonate, buffers excess hydrogen ions, raises blood pH and reverses the clinical manifestations of acidosis.

Indications

- Severe hyperkalaemia.
- Severe TCA overdose with acute decompensation in an unstable patient, i.e. QRS complex $>0.1s$, hypotension or ventricular arrhythmias.

Pharmacological action

- Sodium bicarbonate is an electrolyte solution intended for intravenous use for restoring the balance of the bicarbonate-carbonic acid systems.

Pharmacokinetics

- Onset of action: Immediate.
- Duration of action: 10 minutes.

Contraindications

- Respiratory acidosis.
- Absence of effective ventilation and circulation.

Precautions

- Never combine with calcium chloride in the same infusion and never administer via an infusion line running a fluid containing calcium (e.g. Ringer's lactate), unless the IV line is flushed with NS before and after administration (it may otherwise lead to precipitation).
- Never combine with catecholamines (e.g. adrenaline) in the same infusion (this may lead to inactivation of the catecholamine).
- Not recommended for routine use in cardiac arrest patients.
- A well-placed and free-flowing IV line is mandatory.

Packaging

- Sodium bicarbonate 8.5% 20 mL, 50 mL ampoule, 50 mL mini-bag (1 mEq/mL).
- Sodium bicarbonate 4.2% in various preparations.

Dosage and administration

- 1 mEq/kg IV slowly.
- May be repeated as required.

Miscellaneous notes

- Avoid administering bicarbonate too rapidly.
- The 8.4% and 8.5% solutions may be used interchangeably.
- Use the 4.2% solution for infants under 2 years.
- Ensure adequate ventilation to prevent a rise in serum PCO_2 .

- The volume of bicarbonate to administer to correct symptomatic acute metabolic acidosis can be estimated using the following formula:

$$\text{NaHCO}_3 \text{ (mEq)} = 0.6 \times \text{wt (kg)} \times (\text{desired} - \text{actual serum HCO}_3)$$
- Half this volume is normally administered before rechecking the acid-base status.

SODIUM REPLACEMENT

Miscellaneous notes

- Significant, symptomatic hyponatraemia requires the urgent initiation of management by sodium replacement.
- Symptoms such as CNS depression or seizures are uncommon unless the sodium level drops below 125 mmol/L.
- Sodium replacement may be with hypertonic saline or, more commonly, with NS.
- The volume of NS to administer presented in this book is the volume required to increase the serum sodium by 1 mmol/L. Calculate the volume of NS required to increase the serum sodium to 125 mmol/L and administer this fluid SLOWLY – the maximum fluid administration rate may be found in Chapter 9.
- Too rapid correction of hyponatraemia may result in CNS demyelination and profound neurological injury.

SUXAMETHONIUM (SUCCINYLBCHOLINE)

Overview

Suxamethonium is the first choice muscle relaxant for RSI. It has a short duration of action and cannot be reversed.

Indications

- Suxamethonium provides rapid and complete depolarizing muscle relaxation, of short duration, to facilitate endotracheal intubation during rapid sequence intubation.

Pharmacological action

- Suxamethonium comprises two joined acetylcholine molecules; it stimulates all nicotinic and muscarinic receptors in both the sympathetic and parasympathetic nervous systems, not just at the neuromuscular junction (nicotinic). Muscarinic effects in the SA node can increase or decrease the heart rate and blood pressure.
- Mimicking acetylcholine, suxamethonium initially causes muscle fasciculation, which is then followed by rapid and complete but short-lived depolarizing muscle relaxation.
- Suxamethonium molecules dissociate from the acetylcholine receptors after several minutes, whereupon they are rapidly hydrolysed in the plasma and tissues by pseudocholinesterase.

Pharmacokinetics

- Onset of action: 30–60 seconds.
- Duration of action: 5–10 minutes.

Contraindications

- Muscular dystrophy or myopathies where there is risk of rhabdomyolysis, hyperkalaemia and cardiac arrest.
- Damaged or denervated muscle may develop new acetylcholine receptors outside the neuromuscular junction, stimulation of which may lead

to exaggerated catastrophic release of K^+ from the muscle. However, injured muscle requires at least 24 hours to express these new receptors.

- Stroke, spinal cord injury, prolonged immobilization or severe crush injury.
- Avoid between 24 hours and 1 year after a major burn and in paraplegics or quadriplegics, due to the risk of precipitating increased K^+ .
- Known, pre-existing hyperkalaemia.
- History or family history of malignant hyperthermia.

Precautions

- Pheochromocytoma.
- Neuromuscular disease.
- Severe liver disease.
- Children are more susceptible to adverse events, especially bradycardia. Atropine must be administered prior to giving a second dose of suxamethonium.

Packaging

- Suxamethonium chloride 100 mg/2 mL (50 mg/mL).

Dosage and administration

- Children: 2 mg/kg IV bolus.
- Infants: 3 mg/kg IV bolus.

Miscellaneous notes

- Vagal stimulation may cause increased salivation, decreased BP and bradycardia (more likely with repeated doses). This is almost invariably seen following a second dose, which is why a second dose of suxamethonium should be preceded by atropine premedication.
- Adequate intubating conditions are consistently achieved in less than 1 minute. It is preferable to err on the side of the larger dose to assure rapid onset and good skeletal muscle relaxation; moreover, most adverse reactions are not dose dependent.

THIAMINE

Overview

Intravenous thiamine may be used for acute severe presentations of vitamin B₁ deficiency states.

Indications

- Thiamine should be used where rapid restoration of thiamine is necessary, as in Wernicke's encephalopathy, infantile beriberi with acute circulatory collapse and cardiovascular disease due to thiamine deficiency.
- It is also indicated when giving IV dextrose to individuals with marginal thiamine status to avoid precipitation of heart failure or neurological symptoms.

Pharmacological action

- Thiamine is an important co-enzyme in cellular carbohydrate metabolism.

Pharmacokinetics

- Onset of action: Rapid (unknown).
- Duration of action: Dependent on deficiency state.

Contraindications

- Known hypersensitivity or allergy to thiamine.

Adverse effects

- Pruritus and dermal flushing with large doses.

Precautions

- Anaphylactic reactions have been reported but are rare. They are usually related to the preservative – slow infusion is essential.

Packaging

- Thiamine hydrochloride 100 mg/2 mL (50 mg/mL).

Dosage and administration

- 3 mg/kg IV slowly.

Miscellaneous notes

- Thiamine should be administered within 6 hours of intravenous administration of IV glucose, whenever the possibility of thiamine deficiency is suspected, e.g. malnourishment.

THIOPENTONE**Overview**

Thiopentone (or thiopental) is a short-acting barbiturate used for induction of anaesthesia and the control of seizures.

Indications

- Induction of anaesthesia as part of RSI.
- Control of convulsions in status epilepticus.

Pharmacological action

- Barbiturates bind to and potentiate GABA receptors in the CNS. They produce a dose-dependent depression of the CNS, from sedation to coma.

Pharmacokinetics

- Onset of action: 30–60 seconds.
- Duration of action: 5–15 minutes.

Contraindications

- Porphyria.

Precautions

- Dehydration or shock.
- Severe cardiac impairment (cardiomyopathy or constrictive pericarditis).
- Reduce dose in hypothyroidism, Addison's disease, myasthenia gravis, liver impairment, debilitated patients.
- Propofol is preferred to thiopentone in asthmatics.

Packaging

- Thiopentone sodium 500 mg/vial – dilute to make a 20 mL solution.

Dosage and administration

- 4 mg/kg IV titrated over 60 seconds.
- [Dose range 3 to 7 mg/kg.]

Miscellaneous notes

- Thiopentone should only be administered as a 2.5% dilution into a large vein.

- An infusion of thiopentone should be started after the induction dose for patients with status epilepticus. Continuous EEG monitoring is essential in these children.
- Higher doses may be needed for small children and infants.
- While thiopentone causes a decrease in ICP and cerebral oxygen consumption, the ICP should not be lowered at the expense of a profound drop in BP.

TILIDINE

Overview

Tilidine is an intermediate-efficacy opioid that is easily and readily administered to children.

Indications

- Moderate pain that does not require parenteral treatment.

Pharmacological action

See MORPHINE.

Pharmacokinetics

- Onset of action: 3–5 minutes.
- Duration of action: 4–6 hours.

Contraindications

- Head injuries or increased intracranial pressure.
- Asthma, respiratory depression, cardiac failure.

Precautions

- Hypothyroidism, liver impairment.
- Porphyria.
- Caution recommended in infants under 6 months old.

Packaging

- Tilidine hydrochloride 2.5 mg/drop.

Dosage and administration

- 1 mg/kg/dose (1 drop per 2.5kg body mass).
- Drops are used undiluted sublingually and may be taken with sugar.

Miscellaneous notes

- Do not exceed 1 mg/kg/dose as this may result in unwanted side effects, including seizures.
- If used in infants less than 3 months, a half-strength dose should be used.
- Tilidine is a valuable drug to provide good analgesia without the trauma of a needlestick.

TRAMADOL

Overview

Tramadol is a centrally-acting analgesic with low affinity for μ -opioid receptors. Its minimal 'typical opioid' adverse effect is an advantage over other opioid agents.

Indications

- Moderate to severe pain where other opioids are undesirable.

Pharmacological action

- Morphine receptor antagonist action – opioid effect.
- Synergistic with other opioids – enables a lower dose of opioid to be used.

- Inhibits neuronal reuptake of serotonin and noradrenaline – enhancement of serotonergic and adrenergic pathways.
- Does not cause histamine release.

Pharmacokinetics

- Onset of action: 5–15 minutes.
- Duration of action: 6 hours.

Contraindications

- Head injury, increased intracranial pressure, respiratory depression.

Precautions

- Hepatic or renal impairment.
- Risk or history of seizures.
- Porphyria.
- Potentiation of CNS depression if given in tandem with other CNS depressants.

Packaging

- Tramadol hydrochloride 100 mg/2 mL (50 mg/mL).

Dosage and administration

- 1.5 mg/kg IV slowly.
- A half-strength dose may be repeated after 30 minutes if required.

Miscellaneous notes

- A useful alternative to the typical opioids in the management of severe pain.
- Acts synergistically with conventional opioids and has opioid-sparing properties.
- Has a high incidence of nausea and vomiting, especially with rapid administration.

TRANEXAMIC ACID

Overview

Tranexamic acid may be used for major trauma with uncontrolled haemorrhage, bleeding post-tonsillectomy, for epistaxis and for coagulopathies.

Indications

- In major trauma with uncontrolled haemorrhage, ideally within 1 hour and not after 3 hours from the time of injury.
- Mild haemophilia and in patients with vWD, prior to and after minor surgical procedures or minor trauma. Often used together with desmopressin.
- Uncontrolled epistaxis.
- Significant medical postoperative bleeding.
- Hyphaema.
- Hereditary angioneurotic oedema.

Pharmacological action

- Tranexamic acid inhibits fibrinolysis by inhibiting conversion of plasminogen to plasmin and preventing the binding of plasmin to fibrin. It is useful when life-threatening haemorrhage results from over-activity of the fibrinolytic system.

Pharmacokinetics

- Onset of action: 30 to 60 minutes.
- Duration of action: 7–8 hours.

Contraindications

- Greater than 3 hour delay after major trauma.
- Massive haemorrhage in upper urinary tract – may result in clot retention and ureteric obstruction.
- Thrombotic tendency or active thrombophlebitis.
- Liver impairment.
- Subarachnoid bleeding.

Precautions

- Haematuria.
- Renal impairment.

Packaging

- Tranexamic acid 500 mg/5 mL (100 mg/mL).

Dosage and administration

- 25 mg/kg over at least 5 minutes.
- [Dose range 10 to 50 mg/kg.]

Miscellaneous notes

- May cause seizures when administered in very high doses (>100 mg/kg).
- Tranexamic acid may also be used as a continuous IV infusion of 25–50 mg/kg/day.

VALPROATE

Overview

Valproate, along with phenytoin, is one of the second-line agents for the treatment of status epilepticus.

Indications

- Control of status epilepticus if first-line benzodiazepine treatment has failed.

Pharmacological action

- Valproate acts as an anticonvulsant by reducing high-frequency neuronal firing and inhibiting sodium-dependent action potentials as well as enhancing GABA effects.

Pharmacokinetics

- Onset of action: 10 to 30 minutes.
- Duration of action: 6–8 hours.

Contraindications

- Pre-existing liver disease.
- Porphyria.

Precautions

- History of liver disease; disturbed hepatic, haematopoietic or pancreatic function.
- Children under 2 years of age have an increased risk of potentially fatal hepatotoxicity, especially if they have underlying neurological disease or are on multiple anticonvulsants.

Packaging

- Sodium valproate 400 mg/vial.

Dosage and administration

- Bolus 20 mg/kg IV loading dose over 5 minutes.
- [Dose range 15 to 30 mg/kg.]

- If no response, give an additional 10 mg/kg IV.
- NOTE: dose adjustment required for valproic acid formulation.

Miscellaneous notes

- Sodium valproate is converted to valproic acid (the active agent) – the two available preparations are equivalent, but the effective dose varies. Valproic acid 150 mg is therapeutically comparable to valproate 200 mg.

VASOPRESSIN

Overview

Vasopressin may be administered in shock and cardiac arrest in children. However, there is limited evidence about the use of this drug in children so it should be used with caution.

Indications

- Cardiac arrest, as an alternative to replace either the first or second dose of adrenaline. Only one dose should be administered.
- Catecholamine-resistant hypotension.

Pharmacological action

- Vasopressin is a non-adrenergic peripheral vasoconstrictor with a poorly understood mechanism of action at a cellular level.

Pharmacokinetics

- Onset of action: 1–10 minutes.
- Duration of action: 2–8 hours (variable).

Contraindications

- None for the cardiac arrest or refractory hypotension indications.

Precautions

- Renal insufficiency or hyponatraemia with free water overload.

Packaging

- Vasopressin 10 U/0.5 mL, 20 U/1 mL, 200 U/10 mL (20 U/mL).

Dosage and administration

- 0.5 U/kg IV bolus (maximum dose 40 U).
- [Dose range 0.4–1 U/kg IV bolus.]

Miscellaneous notes

- No difference in ROSC has been found when using vasopressin alone or in tandem with adrenaline. In paediatric emergency care there is currently insufficient evidence for the routine use of vasopressin during cardiac arrest. The results of a large paediatric case series have shown that vasopressin is associated with lower ROSC but unchanged 24-hour and discharge survival.
- A continuous IV infusion can be used for hypotension: 0.2 to 2 milli-units/kg/min.

VECURONIUM

Overview

Vecuronium is a long-acting non-depolarizing muscle relaxant that is often used in the ED and ICU.

Indications

- Maintenance of paralysis to facilitate mechanical ventilation.
- Neuromuscular blocking agent for RSI if suxamethonium and rocuronium are contraindicated or not available.

Pharmacological action

- Competes with acetylcholine at cholinergic (nicotinic) receptors at neuromuscular junction.

Pharmacokinetics

- Onset of action: 1–3 minutes.
- Duration of action: 20–30 minutes.

Contraindications

- Predicted inability to ventilate and oxygenate patient.

Precautions

- Pharmacologically incompatible with thiopentone.
- Increased duration of action in liver disorders.
- Significant prolongation of neuromuscular blockade in renal insufficiency or failure.
- Severe electrolyte disturbances, altered pH and dehydration should be corrected as these conditions enhance the effects of vecuronium.
- Patients with intra-abdominal haemorrhage may lose the tamponading effect of abdominal muscle tone, leading to increased bleeding.

Packaging

- Vecuronium bromide 4 mg per ampoule, 10 mg per vial.
- Acceptable reconstitution fluids include: NS, modified Ringer's lactate, WFI, D5W.

Dosage and administration

Paralysis for RSI

- 0.3 mg/kg IV bolus ("high-dose" vecuronium).

Paralysis for mechanical ventilation

- 0.1 mg/kg IV bolus.
- Repeat after 30–45 minutes if required, at a dose of 0.05 mg/kg.

Miscellaneous notes

- Use for RSI only if there are contraindications to, or lack of availability of suxamethonium or rocuronium.
- High dose for RSI reduces onset of paralysis to 90 seconds.
- Can be reversed with a combination of neostigmine 50 µg/kg and glycopyrrolate 10 µg/kg given intravenously. Complete reversal will only be possible after some spontaneous neuromuscular activity returns.

VERAPAMIL

Overview

Verapamil is a calcium channel blocker with powerful depressant effects on the SA and AV nodes.

Indications

- Chemical cardioversion of SVTs in children who are haemodynamically stable.

Pharmacological action

- Verapamil's antiarrhythmic effects are believed to be brought about by its action on the SA and AV nodes. Verapamil depresses AV nodal

conduction and prolongs the refractory period. Verapamil depresses the amplitude, velocity of depolarization and conduction in atrial conducting fibres. Thus it interrupts re-entrant pathways and slows the ventricular rate.

Pharmacokinetics

- Onset of action: 1–2 minutes.
- Duration of action: 10–20 minutes (effects on the AV node – up to 6 hours).

Contraindications

- Broad complex tachycardias.
- Hypotension or myocardial depression.
- WPW syndrome, atrial tachycardia, atrial flutter.
- Co-administration of β -blockers or other AV-blocking agents.

Precautions

- Verapamil should be used with care in infants because of the risk of hypotension, cardiovascular collapse or cardiac arrest.
- Constant ECG and blood pressure monitoring should be performed during the IV administration of verapamil.

Packaging

- Verapamil hydrochloride 5 mg/2 mL glass vial (2.5 mg/mL).

Dosage and administration

- 0.25 mg/kg IV slowly over 20 to 30 minutes.
- [Dose range 0.1–0.25 mg/kg.]

Miscellaneous notes

- Verapamil has been shown to be safe if administered slowly under adequate monitoring, and is a useful alternative to adenosine.
- Verapamil may also be administered after cardioversion to prevent recurrence of SVTs.

VITAMIN K (PHYTOMENADIONE)

Overview

Phytomenadione is the synthetic form of vitamin K that may be used to correct coagulation abnormalities caused by acquired vitamin K deficiency.

Indications

- Hypoprothrombinaemia.
- Uncontrolled INR caused by warfarin toxicity leading to haemorrhagic sequelae.
- Treatment of overdose of anticoagulant agents used in rodent poisons.
- Haemorrhagic disease of the newborn.

Pharmacological effects

- Vitamin K is essential for normal biosynthesis of coagulation Factors II (prothrombin), VII, IX and X. Warfarin and related agents used in rat poisons inhibit vitamin K-dependent coagulation factors.

Pharmacokinetics

- Onset of action: 1–2 hours; INR returns to normal in 12 to 24 hours.
- Duration of action: 24 hours.

Contraindications

- None in a life-threatening situation.

Precautions

- G6PD deficiency.

Packaging

- Phytomenadione 2 mg/0.2 mL (10 mg/mL); 10 mg/1 mL.

Dosage and administration

- Variable (see dosing tables).
- Injection solution should not be diluted or mixed with other drugs for parenteral use; may, however, be injected into the lower portion of the IV infusion tubing during continuous infusion of NS or D5W.

Miscellaneous notes

- Prolonged administration of vitamin K is required for 'super-warfarin' poisoning, i.e. those warfarin derivatives used in some rodenticides.
- Anaphylactoid reactions with cardiovascular collapse have been associated with intravenous therapy – reserve this route for life-threatening emergencies.
- The effect of phytomenadione on coagulation is variable, so repeated assessment of the coagulation state is important.

EMERGENCY INFUSIONS DRUG INFORMATION**Adrenaline**

Adrenaline is generally used as an inoconstrictor – it is positively inotropic and causes peripheral vasoconstriction. At very low doses (2 to 10 $\mu\text{g}/\text{min}$) it is used as a chronotropic agent for symptomatic bradycardia. This infusion is started at 0.1 $\mu\text{g}/\text{kg}/\text{min}$. Doses below 0.05 $\mu\text{g}/\text{kg}/\text{min}$ can cause paradoxical vasodilation. It may be given via a peripheral IV line or IO line if necessary but administration via a central venous catheter is preferable.

Dopamine

Dopamine is not an ideal first-line vasopressor and its use is decreasing, with noradrenaline and adrenaline more commonly being used. It may also be used for symptomatic bradycardias.

Dobutamine

Dobutamine is an inodilator and is thought to increase splanchnic perfusion in low doses (5 $\mu\text{g}/\text{kg}/\text{min}$). Its chronotropic effects are very useful in children to increase cardiac output. It is often used in combination with adrenaline.

Nitroglycerin

Whereas, in adults, nitroglycerin infusions are not based on weight ($\mu\text{g}/\text{min}$), it is important to note that this is not the case in paediatric patients. It is an ideal agent for hypertensive emergencies associated with pulmonary oedema and/or cardiac ischaemia. Tachyphylaxis to nitroglycerin can occur after 24 hours of continuous use.

Labetalol

Labetalol is useful for reducing blood pressure in hypertensive emergencies. The infusion should be preceded by a loading dose of 0.2 mg/kg. It is a very safe and effective agent.

Phenylephrine

This is a potent vasoconstrictor. It is of benefit as an infusion for patients with hypotension from vasodilation (e.g. septic shock or drug-induced vasodilation) who require an increased afterload.

Nitroprusside

Nitroprusside is used in hypertensive emergencies. It can lead to precipitous drops in blood pressure, therefore careful monitoring of the BP should be done invasively with an arterial line. Light causes drug breakdown, therefore all parts of the infusion need to be shielded. Tachyphylaxis can occur after 24 hours. Methaemoglobinaemia is a known but uncommon complication.

Midazolam

This can be used as an infusion for status epilepticus or for sedation. Caution is advised for its use in patients with renal and hepatic dysfunction due to delayed metabolism and excretion. Prolonged effects may also be observed in obese patients and toxic effects may develop in neonates and infants if doses are not reduced. Monitor for withdrawal symptoms when the infusion is tapered.

Morphine

Infusions of morphine can be helpful where both sedation and analgesia are simultaneously required. Higher infusion rates may be needed for children 2–6 years of age. Neonates and fat children may have prolonged sedation and smaller doses should be used. Monitor for withdrawal symptoms when the infusion is tapered.

Thiopentone

Thiopentone can be used as an infusion for the treatment of status epilepticus. Patients must be intubated and ventilated. The brain metabolic rate is decreased. Supportive vasopressors and inotropes may be required due to the side effect of hypotension. Continuous EEG monitoring is required as patients may appear brain dead. The pharmacokinetics of thiopentone cause it to be deposited in the adipose tissue with repeat dosing. There may therefore be a prolonged time of ventilation whilst the drug is being metabolized even after the infusion is terminated.

Propofol

Propofol can be used as an infusion for the treatment of status epilepticus. Once it is drawn up, it should be administered within 6 hours. Although it contains sodium metabisulfite to retard the growth of microorganisms, it is an emulsion which provides a good medium for bacterial growth. Paediatric patients are more at risk for propofol infusion syndrome (cardiac failure, bradycardia, rhabdomyolysis, severe metabolic acidosis and renal failure). Risk factors include concurrent use of catecholamines, steroids and doses greater than 5 mg/kg for more than 48 hours. EEG monitoring is required to aid with tapering.

Salbutamol

Infusion of salbutamol can benefit patients with severe bronchospasm. Sinus tachycardia is a common side effect.

Lidocaine

A lidocaine infusion can be used as an alternative to amiodarone in maintaining postarrhythmia cardiac stability. Caution is advised if other drugs with antiarrhythmic properties need to be administered e.g. phenytoin.

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Equipment guidelines: pearls and pitfalls

8

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This section is intended to assist you by providing practical tips that are usually only learnt by experience. For all the disposable and reusable equipment, advice is given based on a combination of evidence, best practice, familiarity and availability of possible alternative options.

RESUSCITATION EQUIPMENT

Laryngoscope blade

Traditionally, a straight blade (e.g. Phillips/Miller/Wisconsin) is advised when performing direct laryngoscopy in a child in order to control the large epiglottis. The reality is that either a curved (Macintosh) or a straight blade may be used, depending on the preference of the laryngoscopist. Similarly, the actual size of blade selected is not important as long as the cords are well visualized, dependent both on laryngoscopist comfort and on anatomical factors.

Endotracheal tubes – cuffed vs. uncuffed

A decade ago children were always intubated using uncuffed ETTs but recent research supports the routine use of cuffed ETTs in children over 6 months of age.

Advantages of a cuffed ETT:

- helps to prevent aspiration of gastric contents
 - prevents the leakage of ventilation past the ETT leading to gastric insufflation
 - the use of the exact size is less important than with an uncuffed tube.
- Disadvantages of an uncuffed ETT:
- inability to accurately measure tidal volumes
 - more prone to displacement in the trachea
 - must fit tightly – recent evidence suggests that pressure-related complications might be higher with uncuffed tubes.

While preparing for the intubation, always have the estimated size ETT as well as tubes with an internal diameter 0.5 mm smaller and 0.5 mm larger than the expected size available. Length-based resuscitation tapes are more accurate than age-based formulas in estimating the ETT size for children up to approximately 35 kg. The size of the nostril or the little finger should *never* be used.

ETT cuff pressures must be monitored with a cuff pressure manometer as subjective assessment of cuff pressure is totally unreliable. Pressures should be kept less than 20 cm H₂O and just enough to ensure that there is no leakage of air during positive pressure ventilation.

ETT depth

Unlike adults, the correct position of the ETT is in the mid-trachea. Although most texts suggest that ETT position should be guided by ensuring that the two transverse cord marker lines on the ETT are positioned at the level of the child's vocal cords, the position of these lines can be variable, depending on the manufacturer, and is therefore not advised. Formulas for depth of insertion are often promoted but still are probably not the most accurate way of estimating depth. A useful rule of thumb is to convert the ID into a distance in centimetres that the ETT should be passed distal to the vocal cords. This will apply to both the full size and half size ETT: the tip of a size 4 and 4.5 mm ID ETT should be positioned 4 cm distal to the vocal cords. The technique of using palpation of the ETT in the neck to estimate the depth of insertion is unreliable and should not be used. Depth can be maintained consistently via in-line immobilization of the head and appropriate padding behind the torso or head, depending on age. Any flexion, extension or lateral movement of the head can lead to ETT displacement.

Introducer (stylet)

An introducer should be used in all intubations unless a bougie (tracheal tube introducer) is going to be used. Ensure that the tip of the introducer does not protrude past the tip of the ETT as this may cause trauma to the airway. Bend the tip to about (but no more than) 30° to optimize the chances of first-time intubation success. It is worthwhile to lubricate the stylet prior to inserting it into the ETT to aid in its removal postintubation.

Bougie (tracheal tube introducer)

A bougie should be readily available. This is an intubating stylet that is longer than the standard ETT introducer. A suitable water-based lubricant (or lidocaine spray) should be used for ease of insertion and removal of the bougie once intubation is achieved. Although useful as an adjunct for difficult airways (e.g. Cormack Lehane Grade 3A), the device may be used on easier airways in order to practise and maintain the skill for when it is truly required.

Oropharyngeal airway

The Guedel airway and the Berman airway are two versions of this commonly used device. It is a useful airway adjunct to open an airway in unconscious bag-mask ventilated patients. The size can be estimated by measuring from the corner of the mouth to the angle of the mandible. During insertion the tongue should be controlled by a tongue depressor or laryngoscope blade while inserting the airway along the curvature of the pharynx. Do not insert the airway upside-down and rotate it in the mouth as this can cause trauma to the pharynx.

Nasopharyngeal airway

A nasopharyngeal airway is a valuable adjunct in patients who are unconscious or semi-conscious. A well-lubricated airway can be inserted with the bevelled edge aligned with the septum of the nose. This avoids trauma to the turbinates as well as the nasal septal mucosa. Care should also be taken to ensure that it is inserted parallel to the floor of the nasal cavity to

avoid trauma to the turbinate mucosa. Do not use if a base of skull fracture is suspected. There is no evidence to suggest the optimum measurement for nasopharyngeal airway size. The distance from the nostril to the ipsilateral tragus is commonly used.

Bag-valve resuscitator

The bag-valve resuscitator must be tested before use. This can be done in the following easy steps:

1. Place a hand underneath the patient-connection end.
2. Squeeze the self-inflating portion of the bag and check that air is expelled.
3. Seal the patient-connection end with the palm of your hand.
4. Squeeze the self-inflating portion of the bag and check that there is no leakage in the rest of the bag.
5. If a pop-off valve is present, perform the abovementioned steps first with the valve open, and secondly with the valve closed.
6. Lastly, the reservoir should be attached to the patient-connection end and held in place while the self-inflating portion of the bag is squeezed repeatedly. This should inflate the reservoir bag completely, and reveal any leaks in the reservoir. This also exposes any fault with the one-way non-return valve of the bag-valve resuscitator: if the reservoir inflates and deflates, this may indicate that the one-way valve is dysfunctional.

The infant bag-valve resuscitator should be used on children less than 10 kg. The paediatric bag-valve resuscitator can be used on patients weighing 10–39 kg. The adult bag can be used on patients weighing more than 40 kg. The adult bag can be used on patients weighing less than 40 kg – during ventilation the bag-valve resuscitator should be compressed only with the force required to obtain adequate chest rise.

The oxygen flow rate should be sufficient to ensure that the reservoir bag does not fully collapse at any stage through the respiratory cycle. This flow rate will vary depending on whether an infant, paediatric or adult bag is used. The pop-off valve is designed to prevent pressures in excess of 35–45 cm H₂O from being transmitted to the child's lungs. Certain circumstances may require the pop-off valve to be disabled or locked, such as the ventilation of an asthmatic child with bronchospasm. The high airway pressures will trigger the pop-off valve without allowing adequate ventilation.

Oxygen flow is limited by the duckbill/fishmouth valve at the patient-connection end of the bag-valve resuscitator. It also increases the patient's work of breathing in spontaneously breathing patients. Hence the health-care provider must compress the self-inflating portion of the bag-valve resuscitator in time with the patient's respiratory effort in order to deliver a sufficient flow-rate of oxygen to the child.

The head and neck of the child should be placed in a neutral 'sniffing' position. Hyperextension should be avoided as this can compromise the airway. The proportionately larger head in neonates and infants can lead to flexion of the neck. This can be overcome by placing some padding/linen underneath the shoulders of the infant to lift up the body relative to the head, and to decrease lower cervical spine flexion. The pre-school child (between 1 and 6 years of age) is well-positioned with their head flat. The child over 6 should be positioned with the usual padding/linen under the occiput to achieve the 'sniffing' position.

Mask

Younger children do not have adequate development of their facial features to support an anatomical triangular mask. Hence a round mask is used for children less than 10 kg or less than 1 year of age. The bottom line, however, is to use whichever mask that fits correctly and allows for successful bag-mask ventilation.

Suction catheter

During laryngoscopy, a rigid suction catheter with a non-traumatic tip should be used in order to accurately direct suctioning. If there is a controlling thumb port, remember to occlude this during suctioning attempts. The size given in the text is for soft suction. Use the largest possible suction catheter that can fit through the ETT. Ideally, a closed system should be employed. This helps to prevent loss of PEEP as well as maintaining better infection control. Suctioning may cause vagal stimulation because of contact of the suction catheter with the pharyngeal, laryngeal or tracheal mucosa. If bradycardia ensues, remove the suction catheter and resume ventilation until the heart rate recovers to normal. Make sure that hypoxia from a displaced ETT is not the cause!

Heat-moisture exchanger

The smallest appropriately-sized HME must be used. This helps to minimize dead space ventilation. This fact is often ignored in children. An increase in dead space ventilation leads to hypercarbia, which in turn causes acidosis and vasodilatation which may lead to haemodynamic collapse or even cardiac arrest. Do not use other connective tubing as this also adds to the dead space.

Intercostal drain size (thoracostomy tube)

The largest size drain that will comfortably pass between the ribs should generally be used, although a smaller size can be used for a simple pneumothorax. Tubes should be inserted to a depth that allows for all the drainage holes to be in the chest cavity. Never use a trochar to introduce an intercostal drain. The pressure required to insert it may not be controllable, leading to the disastrous complications of iatrogenic penetrating trauma.

Urethral catheter

If an appropriate size cannot be found, a neonatal feeding tube can be used in an emergency situation. In uncircumcised male children, the foreskin may not be able to be fully retracted – do *not* force it.

Intraosseous needle size and depth

In an emergency setting, intravenous access can be difficult in adults but even more so in children. Intraosseous access, using a sterile technique, should be obtained after one or two rapid attempts at obtaining IV access (although the amount of time spent on attempting IV access depends on the urgency of the clinical situation). Intraosseous administration of drugs is easy and as effective as intravenous administration. The depth given in this book is based on the skin over the bone being compressed for the measurement and applies to the proximal tibial site only.

Nasogastric tube

A nasogastric or orogastric tube should be inserted postintubation. It aids in decompressing the stomach, which can interfere with ventilation and also cause a bradycardia via vagal stimulation. Orogastric tubes are preferred because of the lower incidence of unwanted side effects.

Intravenous access

Intravenous access can be difficult at times – especially in an emergency setting. Do not waste valuable time in this instance. A maximum of two attempts should be made at IV access before making use of the intraosseous technique. Insertion can be aided with the use of an ultrasound machine. If a vessel cannot be visualized with ultrasound, cannulation is unlikely.

Blood pressure cuff

This should ideally be placed around the child's arm and not the leg. An oversized cuff will under-read the BP and an undersized cuff will over-read the BP. An appropriately sized cuff (cuff bladder encircling at least 80% of the arm and extending over 50–75% of the length of the arm from the axilla to the antecubital fossa) should be used to ensure accuracy.

Laryngeal mask airway and laryngeal tube airway

Both these supraglottic devices can be used in the event of a failed intubation. Caution is advised if the patient has severe bronchospasm, facial trauma, pharyngeal pathology (e.g. epiglottitis) or limited mouth-opening. Although conditions requiring higher ventilation pressures are a contraindication to using these devices in adults, supraglottic airways may be effective in these conditions in children.

Central venous catheter size and depth

Central venous access may be useful in children and the access techniques are similar to those used in adults. Femoral and internal jugular vein central venous access should ideally be performed via ultrasound guidance. If fluid volume administration is required, use the largest and shortest catheter possible. The depth of insertion of the CVC may be estimated by the formula:

$$\text{optimal depth of insertion (cm)} = 1.7 + (0.07 \times \text{height}) \text{ for children 40 to 140 cm tall}$$

Alternately, the depth may be estimated from the distance from the puncture site to the right 3rd costochondral junction.

NORMAL VITAL SIGNS

With reference to the Charts in [Chapter 5](#).

Average BP

This is the average expected BP for a patient. It is the 50th percentile for expected age.

Maximum BP

This is the BP on the 95th percentile for expected age. BPs higher than this should be considered to be suggestive of hypertension.

Minimum BP

This is the BP on the 5th percentile for expected age. BPs lower than this should be considered to be hypotension.

As per the recommendations released by the American Heart Association, hypotension is defined as a systolic blood pressure:

- <60 mmHg in term neonates (0 to 28 days).
- <70 mmHg in infants (1 month to 12 months).
- <70 mmHg + (2 × age in years) in children 1 to 10 years.
- <90 mmHg in children ≥10 years of age.

Recent data suggest using 65 mmHg instead of 70 mmHg for children 1–10 years of age.

The interpretation of vital signs, especially blood pressure, is not completely dependable in children because of the wide range of normal values. Other indicators of cardiac output (such as heart rate, capillary refill time, level of consciousness and urinary output) should also be used instead of relying on BP alone.

Heart rate

The 5th, 50th and 95th centiles of heart rate are shown.

Respiratory rate

The 5th, 50th and 95th centiles of respiratory rate are shown.

Urine output

Expected urinary output is about 2 mL/kg infants and 1.5 mL/kg for children.

Peak expiratory flow rate

These predicted values were obtained using a formula that predicts the 50th centile of PEFR in children (see [Chapter 9](#)).

Body surface area

This is an estimated BSA for children of this size on the 50th centile for weight and height.

INITIAL VENTILATOR SETTINGS

FiO₂

The patient should initially be placed on 100% oxygen. This should be reduced as soon as possible according to the arterial blood gas PaO₂ in order to give the lowest possible FiO₂ that will maintain the PaO₂ above 60 mmHg. This helps to reduce the amount of superoxide free radicals which can cause damage.

Respiratory rate

This needs to be adjusted according to the patient's condition, arterial blood gas PaCO₂ level and desired minute ventilation.

Positive end expiratory pressure

This is the pressure used to maintain the patency of the alveoli. Caution is advised in patients with bronchospasm due to the potential for auto-PEEP.

PEEP is potentially deleterious for patients who are hypotensive or in cardiac arrest because of decreased venous return and cardiac output.

Inspiration:expiration ratio

The standard setting is 1:2 or 1:3. Normalization (1:1) or even reversal (2:1 or 3:1) of the ratio may be attempted if oxygenation is difficult.

Inspiratory time

The part of the respiratory cycle spent on inspiration.

Pressure support/assisted spontaneous breath and peak inspiratory pressure

PS and ASB are different terminologies for equivalent breaths which will support the patient's own spontaneous breath and/or the ventilated breath, depending on the primary mode of ventilation chosen.

Some ventilators work on the following principle:

$$\text{PEEP} + \text{PS/ASB} = \text{PIP}$$

where the PS/ASB would be equivalent to the driving pressure.

It should be noted whether the ventilator is applying the PS/ASB above the allocated PEEP (as above) or using it as the Peak Inspiratory Pressure (PIP), thus making the actual driving pressure (PS/ASB – PEEP). The maximum driving pressure should be 18 cm H₂O based on adult studies.

Inspiratory pause/T_{plateau}

This is the potential time between inspiration and expiration. If increased, it can assist in improving oxygenation by allowing for more time for gaseous exchange.

Flow (pressure) trigger

The trigger allows for the adjustment of the ease or difficulty with which a patient is able to take or trigger a breath when attached to a ventilator. The ventilator is able to detect whether the patient has initiated a respiratory effort either by a change in flow or a change in pressure within the circuit. A trigger that is set too high or too low can lead to patient-ventilator asynchrony.

Inspiratory gas flow and waveforms

The flow rate at which the oxygen/air is delivered. The flow rate needs to be greater than the maximum possible inspiratory flow rate of the child. The waveform is the pattern of inspiratory gas flow. The pattern influences the distribution of the inspired gas. The decelerating-flow pattern is preferred in general for use in both adults and children. It delivers the maximum flow at the initiation of inspiration, when resistance is decreased. The flow then decreases during inspiration as delivered gas volume increases. Peak airway pressures are lower than in an accelerating waveform but mean airway pressures are higher.

Tidal volume

This is based on a low tidal volume lung-protective ventilation strategy using a tidal volume of 6 mL/kg. In acidotic children an initial tidal volume of 8 mL/kg may be delivered, which should be reduced as soon as possible.

Minute ventilation

$$MV = RR \times TV$$

$$MV = 0.7\sqrt{\text{Weight}}$$

Volume control – max plateau pressure

The maximum plateau pressure allowed in volume-controlled ventilation in order to avoid ventilator-induced lung injury.

Pressure control – peak inspiratory pressure

The maximum peak pressure allowed in pressure-controlled ventilation in order to avoid ventilator-induced lung injury.

THE PAEDIATRIC RESUSCITATION ROOM

The amount of equipment required in order to perform a full resuscitation on a paediatric patient is extensive. Instead of rushing to try and search for each weight-dependent component, it is much easier to pre-pack all the equipment for each weight group in its own box. There can be one box of reusable equipment and another for the disposable equipment for each weight group. Each weight group box should have an inventory which is checked along with the rest of the resuscitation equipment at each change of shift and should be replenished after use.

The box with reusable equipment should have the following contents:

- Weight measurement tape e.g. PAWPER/Broselow® tape
- Laryngoscope handles
- Laryngoscope blades
- Bag-valve resuscitators
- Masks
- BP cuffs
- Spare batteries and bulbs.

A typical weight group box will have the following disposable equipment:

- Endotracheal tubes
- Introducer
- Bougie
- Oropharyngeal airway
- Nasopharyngeal airway
- Suction catheters – soft and rigid
- Heat-moisture exchanger
- Intercostal drain
- Urethral catheter
- Intraosseous needle
- Nasogastric tube
- IV catheters
- Laryngeal mask airway
- Laryngeal tube airway
- Central venous catheter
- Airtraq™.

Adequate preparation prior to necessity is the key to any resuscitation but in paediatrics is pivotal. Just familiarizing yourself with the equipment and its use, as well as having this reference text for the drug dosing, will help in mitigating your fear associated with resuscitating children.

Useful formulas and information for managing paediatric emergencies

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INTRODUCTION

Sometimes it can be difficult to remember information that is important in managing children in the ED. This chapter contains an assortment of formulas, tables, graphs and lists of the types of data that can be hard to find at short notice. It is not intended to be a comprehensive compendium but merely a collection of those most useful for the acute management of emergent presentations in children.

ACID-BASE BALANCE

Age-specific normal acid-base values in children

Acid-base values change slightly from the moment of birth until adulthood (Table 9.1). The first hour after birth is characterized by a mixed (predominantly respiratory) acidosis which steadily normalizes in the normal neonate. Preterm neonates may have a lower HCO_3^- and lower PaCO_2 for the first month to 6 weeks of life.

Acid-base diagram

Figure 9.1 can be used to elucidate the nature of an acid-base disturbance by plotting pH against PCO_2 or HCO_3^- .

Universal acid-base formula

There is also a 'rule-of-thumb' formula that may be used to rapidly assess acid-base status:

$$\Delta 0.1 \text{ pH} \approx \Delta 12 \text{ mmHg PaCO}_2 \approx \Delta 6 \text{ mmol/L HCO}_3^- \approx \Delta 0.3 \text{ mmol/L K}^+$$

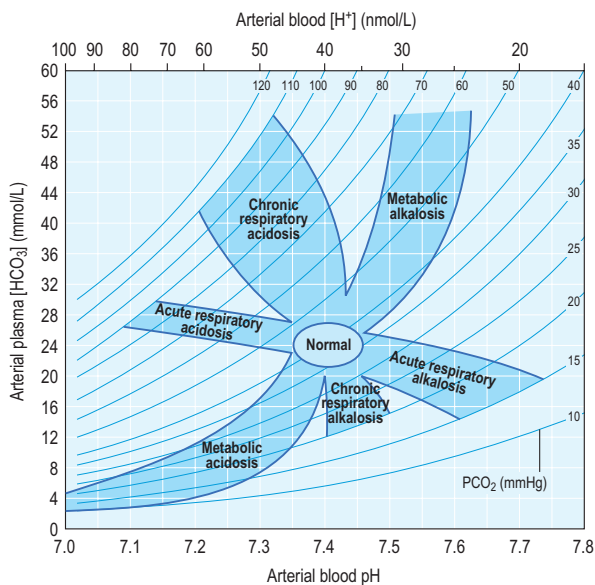
Where Δ = change, \approx = approximately equal to, PaCO_2 = arterial partial pressure of carbon dioxide (mmHg), HCO_3^- = serum bicarbonate (mmol/L) and K^+ = serum potassium (mmol/L).

This predicts that a change in pH of 0.1 may be caused by a change in PaCO_2 of 12 mmHg or a change in HCO_3^- of 6 mmol/L. Similarly, changes in PaCO_2 or HCO_3^- of these amounts will be required to compensate for a change in pH. Potassium will also rise by 0.3 to 0.5 mmol/L for each 0.1 fall in pH and vice versa.

There are more specific equations to predict the expected values for compensation in acid-base derangement (Box 9.1).

Table 9.1 Acid–base normal values from birth to adulthood

	pH	HCO ₃ (mmol/L)	PaCO ₂ (mmHg)	Base excess (mmol/L)
Birth	7.24 (7.14–7.34)	20 (14–26)	49 (29–69)	–14 to –4
Newborn	7.37 (7.18–7.50)	20 (17–24)	34 (27–40)	–10 to –2
Infant	7.39 (7.20–7.50)	22 (19–24)	35 (27–41)	–7 to –1
Toddler	7.40 (7.27–7.49)	22 (19–24)	36 (29–41)	–5 to 0
Child	7.40 (7.34–7.46)	23 (18–25)	37 (32–48)	–4 to +2
Adolescent	7.38 (7.32–7.44)	24 (20–26)	41 (35–47)	–3 to +2
Adult	7.39 (7.37–7.41)	25 (20–28)	41 (37–45)	–3 to +3

**Fig 9.1** An example of an acid–base chart.

Box 9.1 Equations to predict compensation in acid–base derangements

Respiratory compensation for metabolic acidosis:

$$\text{Expected PaCO}_2 = 36^* - [1.25 \times (22^\dagger - \text{Actual HCO}_3)]$$

Respiratory compensation for metabolic alkalosis:

$$\text{Expected PaCO}_2 = [0.6 \times (\text{Actual HCO}_3 - 22^\dagger)] + 36^*$$

Respiratory compensation – simplified formula:

$$\text{Expected PaCO}_2 = (1.5 \times \text{Actual HCO}_3) + 8$$

Metabolic compensation for respiratory acidosis:

$$\text{Acute: Expected HCO}_3 = 22^\dagger + 0.1 \times (\text{PaCO}_2 - 36^*)$$

$$\text{Chronic: Expected HCO}_3 = 22^\dagger + 0.4 \times (\text{PaCO}_2 - 36^*)$$

Metabolic compensation for respiratory alkalosis:

$$\text{Acute: Expected HCO}_3 = 22^\dagger - 0.2 \times (36^* - \text{PaCO}_2)$$

$$\text{Chronic: Expected HCO}_3 = 22^\dagger - 0.4 \times (36^* - \text{PaCO}_2)$$

PaCO₂ = arterial partial pressure of carbon dioxide (mmHg); Actual HCO₃ = actual measured bicarbonate (mmol/L). *Or use age-specific normal values of PaCO₂ for a more precise calculation (see [table 9.1](#)); †or use age-specific normal values of HCO₃ for a more precise calculation (see [table 9.1](#)).

ELECTROLYTES AND FLUIDS**Anion gap**

$$\text{AG} = \text{Na}^+ - (\text{HCO}_3^- + \text{Cl}^-)$$

Where AG = anion gap (mmol/L), Na⁺ = serum sodium (mmol/L), HCO₃⁻ = serum bicarbonate (mmol/L) and Cl⁻ = serum chloride (mmol/L). The upper limit of normal for the anion gap is 12 mmol/L. Some formulas include K⁺ on the cationic side of the equation, in which case the upper limit of normal is slightly higher (16 mmol/L).

Sodium deficit in hyponatraemia

$$\text{NS} = [0.6 \times \text{wt} \times (\text{desired Na}^+ - \text{actual Na}^+)] \times 6.49$$

$$\text{Rate of administration} = \text{wt} \times 3.9$$

Where NS = volume (mL) of 0.9% normal saline to administer to correct Na⁺ deficit, wt = weight (kg), desired Na⁺ = the minimum level required (normally 130 mmol/L), and rate of administration = (mL/hr) based on a maximum infusion of 0.6 mmol/kg/hr.

Parkland formula

$$\text{Fluid requirement} = 4 \times \text{wt} \times \% \text{BSA}$$

Where fluid requirement (mL) = the total fluid volume to infuse (over and above normal maintenance fluids): half in the first 8 hours from the time of the burn and the second half in the subsequent 16 hours; wt = weight

in kg and %BSA = burn surface area as a percentage of total body surface area (see Fig. 1.7).

RESPIRATORY SYSTEM

Acute lung injury ratio

$$\text{ALIR} = \text{PaO}_2 / \text{F}_i\text{O}_2$$

Where PaO_2 = partial pressure of oxygen (mmHg) and F_iO_2 = fraction of inspired oxygen (in decimal form, e.g. 0.4).

This is also known as the P/F ratio. A value of <300 indicates the presence of acute lung injury and a value of <200 the presence of acute respiratory distress syndrome (ARDS).

Oxygen index

$$\text{Oxygen index} = (\text{F}_i\text{O}_2 \times \text{MAP}) / \text{PaO}_2$$

Where F_iO_2 = fraction of inspired oxygen (in percentage form, e.g. 40%), MAP = mean airway pressure (mmHg) and PaO_2 = partial pressure of oxygen (mmHg).

An oxygen index >40 suggests the need for extracorporeal membrane oxygenation techniques in appropriately selected neonates.

Estimated minute ventilation requirements

This formula allows for the estimation of ventilation requirements of the critically ill child (based on metabolic factors) to maintain a normal PaCO_2 :

$$\text{MV} = 0.7 \times \sqrt{\text{wt}}$$

Where MV = minute ventilation (L/min), wt = weight (kg) and RR = ventilator respiratory rate.

This formula allows for the determination of the estimated required ventilation rate for children with a tidal volume of 6 mL/kg, based on expected metabolic requirements.

$$\text{RR} = 117 / (\sqrt{\text{wt}})$$

Predicted peak expiratory flow rate

$$\text{PEFR} = 100 + [5 \times (\text{ht} - 100)]$$

Where PEFR = peak expiratory flow rate (L/min) and ht = height (cm).

This formula approximates the 50th centile for peak expiratory flow rate in children taller than 100 cm. More precise values should be obtained from tables or electronic applications as soon as time permits (Table 9.2).

Endotracheal tube size and length

$$\text{Uncuffed ETT} = 4 + \text{age}/4$$

Where ETT = endotracheal tube internal diameter (mm) and Age = age in years. For infants less than a year use a 3.5 mm ETT; for children between 1 and 2 years of age a 4 mm ETT; after 2 years use the formula above.

$$\text{Cuffed ETT} = 3.5 + \text{age}/4$$

For infants less than a year use 3.0 mm ETT; for children between 1 and 2 years of age a 3.5 mm ETT; after 2 years use the formula above.

$$\text{Depth of insertion} = 12 + \text{age}/2$$

Table 9.2 Peak expiratory flow rate normal values for stature (or length) from 85 to 160 cm

EU flow meter			Length (cm)	Mini-Wright flow meter		
50%	75%	Predicted		Predicted	75%	50%
43	65	87	85	84	63	31
47	71	95	90	96	72	36
52	78	104	95	110	82	41
57	86	115	100	126	94	47
63	95	127	105	143	107	53
70	105	141	110	163	122	61
78	117	157	115	185	138	69
87	130	174	120	208	156	78
96	144	192	125	231	173	86
106	159	212	130	256	192	96
116	174	233	135	281	210	105
127	190	254	140	305	228	114
138	207	276	145	330	247	123
149	224	299	150	355	266	133
161	242	323	155	379	284	142
173	259	346	160	402	301	150

Values are shown for the European Union (EU) flow meter as well as the standard Mini-Wright flow meter. The predicted peak flow rates as well as the values that represent 75% and 50% of predicted are shown.

CARDIOVASCULAR SYSTEM

Minimum systolic blood pressure

$$SBP = 70 + (\text{Age}_{\text{yr}} \times 2)$$

Where SBP = systolic blood pressure and Age_{yr} = age in years. This formula approximates the 5th centile for systolic blood pressure from age 1 to 10 years.

Maximum systolic blood pressure

$$SBP = 110 + (\text{Age}_{\text{yr}} \times 1.8)$$

This formula approximates the 95th centile for systolic blood pressure from age 1 to 18 years.

Maximum diastolic blood pressure

$$\text{Diastolic blood pressure} = 73 + \text{Age}_{\text{yr}}$$

This formula approximates the 95th centile for diastolic blood pressure from age 1 to 18 years.

Minimum mean arterial pressure

$$\text{Mean arterial pressure} = 40 + 1.5 \times \text{Age}_{\text{yr}}$$

This formula approximates the 5th centile for mean arterial blood pressure from age 1 to 18 years.

Paediatric ECG assessment

See Figure 9.2 for a comprehensive scheme for assessing paediatric ECG results.

PAEDIATRIC ECG ASSESSMENT FORM	
	R-R interval (big blocks) 1 2 3 4 5 6 7 8 9 10 Rate 300 150 100 75 60 50 43 38 33 30
Rate:	Is atrial and ventricular rate the same? Bradycardia [†] / Tachycardia [†] / Accelerated rhythm? Rates > 220bpm in infants and > 180bpm in children are almost always pathological. Add 10 to 14 bpm to normal range for every 1°C rise in core temperature > 38°C
Rhythm:	Is every QRS preceded by an identical P-wave? Is atrial and ventricular rate the same? Regular / Irregular? Absence of sinus arrhythmia is suggestive of SVT. PAC / PJC / PVC / Escape beats? Is P upright in S1, S2, aVF? If not then SR not likely. V1 and S3 are the best leads to identify SVTs in children
QRS axis:	Generally normal if S1 and aVF are both positive [†] . Axis is 90° to most isoelectric and equiphasic leads. Northwest axis = ?Atrioventricular canal defect
P wave:	Present / absent? Retrograde? Multifocal? Saw tooth = IART? Configuration? (especially S2 and V1)
PR (PQ)	Short or long? AV block? (1° / 2° type I / 2° type II / 3°) Regular / Irregular block? Ratio? Is P wave rate faster than ventricular rate?
QRS complex:	Width? Height? (Electrical alternans?) QRS < 5mm in limb leads = ?myocarditis. Normal R wave progression? Normal age-related R/S ratios? LBBB? (V1 "W" or "U"-shaped / V6 "M"-shaped) RBBB? (V1 "M"-shaped / V6 "W" or "U"-shaped) Bifascicular block (RBBB with LAD or RBBB with RAD)? Trifascicular block (bifascicular block with 1° AVB)? Pathological Q wave? (>0.03s wide & deeper than ¼ of R wave) Other waves? (Delta wave, Osborne wave, Pacing spikes) Small complexes? Consider tamponade / hypothyroidism / myocarditis / technical factors
ST segment:	Elevation / Depression? Shape? (Saddle / Camel-hump) Pericarditis – PR depression, global ST elevation with ST depression in aVR? ST deviation of 1mm in limb leads and 2mm in V4, V5 and V6 may be normal
T wave:	Newborns: flat or inverted T waves are normal / From age 1wk to 8yrs inverted T waves in V1, V2, V3 are normal. Upright T wave in V1 after age 3 days = RV+ Tall? (Symmetrically peaked with narrow base = HyperK ⁺ / HyperMg ²⁺) Inverted? Dynamic / Fixed? T wave alternans?
QT interval:	Bazett's formula: QTc = (QT interval / √R-R interval) or QTc = QT × √(HR/60) (measured in S2). Normal QT interval is < half the R-R interval [†]
Hypertrophy (Chamber size):	LA+ P wave broad (> 0.08s in infants, > 0.1s in children, > 0.12s adolescents) & notched in S2 or inverted / biphasic in V1 or V3R. RA+ P wave tall & peaked in S2 and V1 (> 3mm 0 to 6 months, > 2.5 mm others). LV+ LAD with tall R in V5 or V6 [†] , small R wave in V1 or V2 [†] , deep S in V1 [†] , Q wave deeper than 5mm in V5 or V6, inverted T in V6, LV strain pattern. RV+ RAD in older children with tall R in V1 [†] , rSR in V1 with R > 15mm in infants or R > 10mm in children, deep S in V6 [†] , Q in V1, upright Ts in V1, V2, V3. Strain pattern? Asymmetrical ST depression with T wave inversion, LV strain in leads S1, aVL, V4–V6, RV strain in leads S2, S3, aVF, V1–V3
Ischaemia:	ST elevation ≥ 1mm / ST depression ≥ 0.5mm in contiguous leads? Pathological Q waves? T wave inversion or hyperacute T waves? RV infarction? (Look at aVR & V4R) Posterior infarction? (V1 – "inverted mirror image") Additional views? (e.g. V7, V8, V9)
Metabolic:	HyperK ⁺ = tall, peaked T waves with narrow base, T wave > R wave in 2 or more leads, HypoK ⁺ = big U wave, HyperMg ²⁺ = peaked T wave, HypoMg ²⁺ = long QTc, HyperCa ²⁺ = short QT, HypoCa ²⁺ = long QTc

[†]See Fig 9.2B for age-specific normal values and ranges, see Fig 9.2C for list of abbreviations

Fig 9.2A Paediatric ECG assessment form.

PAEDIATRIC ECG ASSESSMENT FORM (Cont'd)										
Age-specific normal interval ranges										
Age	HR (bpm)	QRS axis (degrees)	PR interval (sec)	QRS interval (sec)	QTc interval (sec)	R in V1 (mm)	S in V1 (mm)	R in V6 (mm)	S in V6 (mm)	
1st wk	90–160	60–180	0.08–0.15	0.03–0.08	0.49	5–26	0–23	0–12	0–10	
1–3 wk	100–180	45–160	0.08–0.15	0.03–0.08	0.49	3–21	0–16	2–16	0–10	
1–2 mo	120–180	30–135	0.08–0.15	0.03–0.08	0.49	3–18	0–15	5–21	0–10	
3–5 mo	105–185	0–135	0.08–0.15	0.03–0.08	0.49	3–20	0–15	6–22	0–10	
6–11mo	110–170	0–135	0.07–0.16	0.03–0.08	0.44	2–20	0.5–20	6–23	0–7	
1–2 yr	90–165	0–110	0.08–0.16	0.03–0.08	0.44	2–18	0.5–21	6–23	0–7	
3–4 yr	70–140	0–110	0.09–0.17	0.04–0.08	0.44	1–18	0.5–21	4–24	0–5	
5–7 yr	65–140	0–110	0.09–0.17	0.04–0.08	0.44	0.5–14	0.5–24	4–26	0–4	
8–11 yr	60–130	–15–110	0.09–0.17	0.04–0.09	0.44	0–14	0.5–25	4–25	0–4	
12–15 yr	65–130	–15–110	0.09–0.18	0.04–0.09	0.44	0–14	0.5–21	4–25	0–4	
>16 yr	50–120	–15–110	0.12–0.20	0.05–0.10	0.44	0–14	0.5–23	4–21	0–4	
ECG manifestations of congenital heart disease										
Condition	Age of onset	Cyanotic	PBF	RV+	LV+	RA+	LA+	RAD	LAD	RBBB
PDA	2–3 wks		↑		x					
ASD	Variable			x		x		x		x
VSD	2–12 wks		↑	x	x				x	x
Coarctation of aorta	1 wk			x	x			x		
TOF	1–12 wks	x	↓	x				x		
TGV	1 wk	x	↑	x				x		
Truncus arteriosus	Infancy	x	↑	x	x					
TAPVD	1 wk	x	↑	x						
Tricuspid atresia	1–4 wks	x	↓		x	x			x	
Pulmonary atresia	Variable				x					
Hypoplastic left heart	1 wk	x	↑	x						
Aortic stenosis	Variable				x					
Pulmonary stenosis	1–4 wks		↓	x		x		x		
AVCD	2–3 wks		↑	x	x	x	x		x	x
HCM	Variable				x		x			

See Fig 9.2C for list of abbreviations

See Fig 9.2C for list of abbreviations

Fig 9.2B

Continued

NERVOUS SYSTEM

Pain scoring systems are an essential component of analgesic practice in the ED. These two systems have been used across the world and can be simply and quickly applied. Although they have been used mostly in the setting of chronic pain, they have been validated in the ED.

Wong Baker faces

Pain in children is often underestimated by parents and doctors alike. This system (Fig. 9.3) can be used by asking children to point out the face that best represents how they are feeling. A decrease in the indicated pain will provide proof of analgesic efficacy or the need for additional analgesia.

Behavioural observational pain scale (BOPS)

Younger children and infants cannot self-report pain effectively. There are several observational pain systems, of which the BOPS is an example (Table 9.3). A pain scale should be used to obtain an indication of pain or discomfort in young children and the need for analgesia.

Sedation scores

Procedural sedation is a core skill for ED practice and patient safety is of paramount importance in its performance. Although dissociative agents are most frequently used in children (for which there is no sedation scale)

PAEDIATRIC ECG ASSESSMENT FORM (Cont'd)		
Common indications for obtaining an ECG in children: Chest pain, seizure, syncope, suspected arrhythmia, apparent life threatening event, toxicological evaluation, electrocution, electrolyte abnormalities.		
Before reading the ECG:		
Check the child first: <i>General appearance:</i> lethargic, fussy or listless, poor feeding? <i>Airway:</i> Clear / Maintainable / Needs intubation? <i>Breathing:</i> RR, O ₂ saturations, Colour, Work of breathing? Breath sounds? <i>Circulation:</i> BP, HR, Perfusion / capillary refill, level of consciousness, rhythm too fast or too slow to wait ECG? Check the basics: Does the ECG belong to the correct child? Are the ECG settings correct? Paper speed (25mm/sec), Calibration (1cm/mV), AC Filter settings (50Hz / 60Hz), Diagnostic frequency range (0.05–250Hz) Are the leads correctly positioned? (P wave should be upright in S1 and inverted in aVR) Is the ECG of sufficient quality and free from interference to allow for interpretation of rhythm, ST segment deviation and chamber size?		
After reading the ECG:		
Mild abnormality – paediatrician follow-up advised	Moderate abnormality – needs paediatric cardiology follow-up	Significant abnormality – needs immediate paediatric cardiology referral
Premature atrial complexes, Atrial enlargement, Sinus bradycardia / tachycardia, Incomplete RBBB, RAD age < 13yrs, LAD, Non-specific ST changes, Ectopic atrial rhythm, Wandering atrial pacemaker, 1° AVB, Low voltage, Junctional rhythm	2° AVB, Frequent PVCs, RBBB or LBBB, Intraventricular conduction delay, ST changes consistent with ischaemia, LVH, RVH, Northwest axis, Biventricular hypertrophy, Bifascicular / trifascicular block, WPW syndrome, Prolonged QTc, Abnormal R wave progression, RAD >12 yrs	3° AVB, Pacing with loss of capture, Atrial fibrillation, Chaotic atrial tachycardia, Ventricular tachycardia, SVT, Atrial tachycardia, ST changes suggestive of AMI
Tables adapted from: Wathen JE, Rewers AB, Yetman AT, Schaffer MS 2005 Accuracy of ECG interpretation in the paediatric emergency department. <i>Ann Emerg Med</i> 46(6):507–511 and Sharieff GQ, Rao SO 2006 The paediatric ECG. <i>Emerg Med Clin N Am</i> 24: 195–208. AMI = acute myocardial infarction, AS = aortic stenosis, ASD = atrial septal defect, AV = atrioventricular, AVB = atrioventricular block, AVCD = atrioventricular canal defects, ECG = electrocardiogram, HCM = hypertrophic cardiomyopathy, IART = intra-atrial re-entry tachycardia, LA = left atrium, LAD = left axis deviation, LBBB = left bundle branch block, LV = left ventricle, LVH = left ventricular hypertrophy, PAC = premature atrial complex, PDA = patent ductus arteriosus, PJC = premature junctional complex, PVC = premature ventricular complex, QTc = corrected QT interval, RA = right atrium, RAD = right axis deviation, RBBB = right bundle branch block, RV = right ventricle, RVH = right ventricular hypertrophy, SVT = supraventricular tachycardia, TAPVD = total anomalous pulmonary venous drainage, TGV = transposition of the great vessels, TOF = tetralogy of Fallot, VSD = ventricular septal defect, WPW = Wolff-Parkinson White syndrome. This calculator is designed to be used with an ECG with a paper speed of 25mm/sec. To calculate heart rate, measure over 2 R-R intervals. To estimate whether the QTc falls in the normal range, measure the QT interval from the Q wave to the end of the T wave against the vertical bar at the appropriate heart rate. If the T wave has returned to the isoelectric line within the area indicated by the thick bar then the QTc is normal.		
<p>Heart Rate (use 2 R-R intervals) and QTc Calculator</p>		

Fig 9.2C

other agents need to be used to target a particular level of sedation. The Ramsay (Table 9.4) and American Society of Anaesthesiologists (Table 9.5) sedation scales are useful to evaluate and document sedation levels.

Paediatric Glasgow Coma Scale

The adult Glasgow Coma Scale (GCS) has been modified for application to infants and children (Table 9.6).

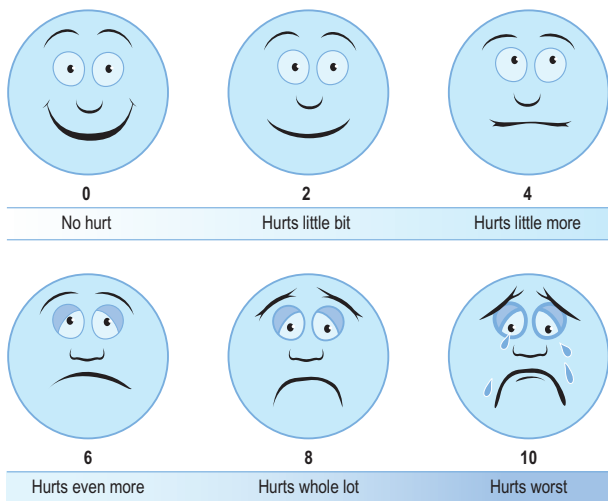


Fig 9.3 The standardized Wong Baker faces which can be used for self-assessment of acute pain by children in the ED.

Table 9.3 The behavioural observational pain score (BOPS)

Score	Facial expression	Verbalization	Body position
0	Neutral/positive facial expression, composed, calm	Normal conversation, laugh, happy vocalization	Inactive, lying with all extremities relaxed or sitting, walking
1	Negative facial expression, concerned	Completely quiet or sobbing and/or complaining but not because of pain	Restless movements, shifting fashion and/or touching painful area
2	Negative facial expression, grimace, distorted face	Crying, screaming and/or complains about pain	Lying rigid and/or with arms and legs drawn up to the body

Add the score for each of the components to obtain a BOPS score. A score of >2 indicates the need to initiate or provide additional pain management or analgesia.

Table 9.4 The Ramsay sedation scale

Score	Response
1	Anxious or restless or both
2	Cooperative, orientated and tranquil
3	Responding to commands
4	Brisk response to stimulus
5	Sluggish response to stimulus
6	No response to stimulus

Spinal nerve root assessment

Accurate evaluation of spinal cord function or injury is essential after trauma in children. Sensory and motor maps (Table 9.7) allow for determination of the level of spinal cord injury as well as the exclusion of spinal cord injury by examining the function of the spinal nerve roots.

BODY COMPOSITION

Body mass index

$$\text{BMI} = \text{wt}/(\text{ht})^2$$

Where wt = weight (kg) and ht = height (m).

Body surface area

Both Mosteller's formula and Haycock's formula may be used for children.

$$\text{BSA} = [(\text{ht} \times \text{wt})/3600]^{0.5} \quad (\text{Mosteller's formula})$$

$$\text{BSA} = \text{wt}^{0.5378} \times \text{ht}^{0.3964} \times 0.024265 \quad (\text{Haycock's formula})$$

Where BSA = body surface area (m^2), wt = weight (kg) and ht = height (cm).

Boyd's formula may be used to estimate body surface area by using weight alone, which is useful if height is not known or cannot be measured. This formula is accurate to within about 10% of BSA estimations by Mosteller's formula. (Note that weight must be entered as grams ($\text{kg} \times 1000$) and the resultant BSA is reflected in cm^2 ($\text{m}^2 \times 10000$).)

$$\text{BSA} = 4.688 \times \text{wt}^{(0.8168 - 0.0154 \times \log \text{wt})} \quad (\text{Boyd's formula})$$

Ideal body weight

$$0 \text{ to } 6 \text{ months: IBW} = 3.6 + 0.7 \times \text{Age}_{\text{mo}}$$

$$7 \text{ to } 12 \text{ months: IBW} = 5.2 + 0.417 \times \text{Age}_{\text{mo}}$$

$$13 \text{ to } 24 \text{ months: IBW} = 8 + 0.183 \times \text{Age}_{\text{mo}}$$

$$2 \text{ to } 10 \text{ years: IBW} = 7.88 + 2.32 \times \text{Age}_{\text{yr}}$$

$$10 \text{ to } 16 \text{ years: IBW} = 3.3 + 3.15 \times \text{Age}_{\text{yr}}$$

Where Age_{mo} = age (months), and Age_{yr} = age (years).

Table 9.5 The ASA sedation scale

Level of sedation	Definition
Minimal sedation (anxiolysis)	<ul style="list-style-type: none"> • Drug-induced state • Patients respond normally to verbal commands • Cognitive function and co-ordination may be impaired • Ventilatory and cardiovascular functions are unaffected
Moderate sedation/analgesia	<ul style="list-style-type: none"> • Drug-induced depression of consciousness • Patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation • No interventions are required to maintain a patent airway • Spontaneous ventilation is adequate • Cardiovascular function is usually maintained
Deep sedation/analgesia	<ul style="list-style-type: none"> • Drug-induced depression of consciousness • Patients cannot be easily aroused • Patients respond purposefully following repeated or painful stimulation • The ability to independently maintain ventilatory function may be impaired • Patients may require assistance in maintaining a patent airway • Spontaneous ventilation may be inadequate • Cardiovascular function is usually maintained
General anaesthesia	<ul style="list-style-type: none"> • Drug-induced loss of consciousness • Patients are not arousable even by mild painful stimulation • Ability to independently maintain ventilatory function is often impaired • Patients often require assistance to maintain a patent airway • Positive pressure ventilation may be required due to depressed spontaneous ventilation and drug-induced depression of neuromuscular function • Cardiovascular function may be impaired

Table 9.6 The Glasgow Coma Scale as modified for children and infants

Component	Adult	Child	Infant	Score
Eye opening	Spontaneous	Spontaneous	Spontaneous	4
	To voice	To voice	To voice	3
	To pain	To pain	To pain	2
	None	None	None	1
Best verbal response	Oriented	Oriented, appropriate	Coos and babbles/smiles, orientated to sound, follows objects, interacts	5
	Confused	Confused	Irritable, cries/crying, is consolable, interacts inappropriately	4
	Inappropriate words	Inappropriate words	Cries in response to pain/moans, is inconsistently consolable, is irritable	3
	Incomprehensible sounds	Incomprehensible words/non-specific sounds	Moans in response to pain/is inconsolable, restless	2
	None	None	None	1

Best motor response	Obeys	Obeys commands	Moves spontaneously, purposefully	6
	Localizes painful stimulus	Localizes painful stimulus	Withdraws in response to touch	5
	Withdraws from painful stimulus	Withdraws from painful stimulus	Withdraws in response to pain	4
	Abnormal flexion response to pain	Flexion response to pain	Flexion response to pain	3
	Abnormal extension to pain	Extension response to pain	Extension response to pain	2
	None	None	None	1
Normal scores:		15	0 to 6 months 9 6 to 12 months 11	15

Table 9.7 The sensory and motor pathways to map out the testing of spinal nerve roots

Dermatome map (sensory function)	Myotome map (motor function)
C5 – area over the deltoid muscle	C5 – abduction at shoulder (deltoid muscle)
C6 – thumb	C6 – flexion at elbow (biceps muscle) and extension at wrist (wrist extensors)
C7 – middle finger	C7 – extension at elbow (triceps muscle)
C8 – little finger	C8 – flexion of distal interphalangeal joint of middle finger (flexor digitorum profundus)
T1 – medial aspect of forearm	T1 – abduction of little finger (abductor digiti minimi)
T4 – nipple line (remember the cervical cape of C4)	L2 – flexion at the hip (psoas and iliacus)
T8 – level of xiphisternum	L3, L4 – extension at the knee (quadriceps)
T10 – level of umbilicus	L4, L5, S1 – flexion at the knee (hamstrings)
T12 – level of pubic symphysis	L5 – dorsiflexion of ankle and hallux (tibialis anterior, extensor hallucis longus)
L4 – medial aspect of calf	S1 – plantarflexion of the ankle (gastrocnemius and soleus)
L5 – webspace between 1st and 2nd toes	
S1 – lateral border of foot	
S3 – skin overlying ischial tuberosity	
S4 and S5 – perianal area	

Adjusted body weight

$$ABW = IBW + [0.4 \times (TBW - IBW)]$$

Where ABW = adjusted body weight (kg), IBW – ideal body weight (kg) and TBW – total body weight (kg).

Catzel's percentage method of drug dose calculation

There are many ways to calculate drug doses in children, the most accurate of which are length-based tape systems. [Table 9.8](#) represents another method of estimating drug doses which can be used if a more accurate system is not available.

CONVERSIONS

Weight, length and temperature

[Table 9.9](#) provides the conversion factors for commonly used metric and imperial units of measurement.

Measurements of pressure

In [Table 9.10](#), find the row of the unit that you wish to convert from and follow it across to the unit that you wish to convert to. Multiply by that factor to convert to the new unit.

Table 9.8 Catzel's percentage method of drug dose estimation

Dosage calculations			
Age	Wt (kg)	BSA (m ²)	% of adult dose
2 weeks	3	0.2	12.5
2 months	4.5	0.26	15
4 months	6.5	0.34	20
8 months	8.5	0.41	23
1 year	10	0.47	25
3 years	14	0.58	33
4 years	17	0.71	40
6 years	20	0.8	45
7 years	23	0.89	50
10 years	32	1.11	63

Table 9.9 Weight, length and temperature conversion factors

Weight	Length	Temperature
1 kg = 2.2 pounds 1 pound = 0.45 kg	1 cm = 0.39 inch 1 inch = 2.54 cm 1 cm = 10 mm	$C = \frac{5}{9} \times (F - 32)$ $F = 32 + (C \times \frac{9}{5})$ C – degrees Centigrade F – degrees Fahrenheit

Table 9.10 Conversion factors for commonly encountered units of pressure measurement

Pressure					
	mmHg	mbar	PSI	cmH ₂ O	kPa
mmHg	1	1.3337	0.1934	1.3635	0.13337
mbar	0.7501	1	0.0145	1.0227	0.1
PSI	51.715	69.948	1	70.515	6.9948
cmH ₂ O	0.7334	0.9777	0.0142	1	0.0977
kPa	7.501	10	0.145	10.227	1

mmHg – millimetres of mercury; mbar – millibar (which is equivalent to a hectopascal); PSI – pounds per square inch; cmH₂O – centimetres of water at 25°C; kPa – kilopascal.

Laboratory test units

See Table 9.11 for conversion factors applicable to lab results.

Steroid equivalence

The potency of systemic steroids is represented by a comparison to intravenous hydrocortisone. In general, the choice of steroids is related to

Table 9.11 Conversion factors for SI and non-metric units of measurement for laboratory investigations commonly used in the ED

Laboratory units		
Bilirubin	1 $\mu\text{mol/L}$ = 0.058 mg/dL	1 mg/dL = 17.2 $\mu\text{mol/L}$
Calcium	1 mmol/L = 4 mg/dL	1 mg/dL = 0.25 mmol/L
Cholesterol	1 mmol/L = 38.61 mg/dL	1 mg/dL = 0.0259 mmol/L
Creatinine	1 $\mu\text{mol/L}$ = 0.013 mg/dL	1 mg/dL = 76.9 $\mu\text{mol/L}$
Glucose	1 mmol/L = 18.02 mg/dL	1 mg/dL = 0.055 mmol/L
Lactate	1 mmol/L = 9.01 mg/dL	1 mg/dL = 0.111 mmol/L
Magnesium	1 mmol/L = 2.43 mg/dL	1 mg/dL = 0.412 mmol/L
Phosphate	1 mmol/L = 3.1 mg/dL	1 mg/dL = 0.323 mmol/L
Urea	1 mmol/L = BUN 2.8 mg/dL	1 mg/dL BUN = 0.357 mmol/L

the specific clinical condition but alternatives may be used in equipotent doses.

- Hydrocortisone – short acting with a relative potency of 1.
- Prednisone or prednisolone – intermediate acting with a relative potency of 4.
- Dexamethasone – long acting with a relative potency of 25.
- Betamethasone – long acting with a relative potency of 30.
- Triamcinolone – intermediate acting with a relative potency of 5.

Opioid equivalence

The strength of intravenous opioid analgesics is generally related to the potency of a 10 mg dose of morphine. These figures are not precise but do offer an indication of relative dosing requirements.

- Morphine 10 mg – duration of action 3 to 4 hours.
- Diamorphine 5 mg – duration of action 3 to 4 hours.
- Fentanyl 0.1 mg – duration of action 1 hour.
- Alfentanil 1 mg – duration of action 20 minutes.
- Tramadol 100 mg – duration of action 4 to 6 hours.
- Pethidine (meperidine) 75 mg – duration of action 2 to 3 hours.

Opioid doses need to be individualized in all patients, but especially children. Infants less than 6 months metabolize opioids slowly and are at greater risk for side effects from repeated doses or infusions than older children. Doses need to be a bit higher in children from 2 to 6 years of age, when compared to adults, because of their higher metabolic rates.

MISCELLANEOUS

Insulin infusion

An insulin infusion at 0.1 U/kg/hr is, in general, preferable to an insulin sliding scale. There are times when a sliding scale is required and [Table 9.12](#) is an example of one such scale.

Table 9.12 A weight-based insulin sliding scale for children and infants

Glucose mmol/L	Action	3–5 kg	6–7 kg	8–9 kg	10–11 kg	12–14 kg	15–18 kg	19–22 kg	24–30 kg	32–36 kg
<3.0	Give D25W IV (mLs shown) and recheck in 15 min	16	26	36	45	52	66	82	106	136
3.1–5.0	Give insulin subcutaneously – according to the indicated dose	0	0	0	0	0	0	0	0	0
5.1–9.0		0.5	0.5	0.5	0.5	1	1	1	1	2
9.1–11.0		0.5	1	1	1	1	2	2	3	3
11.1–16.0		1	1	2	2	3	3	4	5	7
16.1–20.0	Give soluble insulin IV and recheck in 1 hr [†]	1	2	3	3	4	5	6	8	10
>20.0		2	3	3	4	5	7	8	11	14

Dilution for amounts <10 U: draw 10 U soluble insulin into insulin syringe; draw up NS 0.9 mL to total 100 U (1 mL); dilution is 0.1 U/0.1 mL division.
[†]If glucose is >20 mmol/L for 2 successive readings, commence insulin infusion.

Paediatric trauma score

Early objective assessment of the severity of injury (see Table 9.13) is an essential component of managing the paediatric trauma victim in the ED. Severely injured children should ideally be treated at a facility that specializes in treating children as outcomes are better.

APGAR score

The APGAR score (Table 9.14) is useful, and of particular relevance, for neonates that are born in the ED as unplanned or unexpected deliveries.

Table 9.13 The paediatric trauma score

Component	+2	+1	-1
Weight	>20 kg	10–20 kg	<10 kg
Airway	Normal	Maintainable	Unmaintainable
CNS (AVPU)	Awake (alert)	Obtunded (responds to voice)	Comatose (responds to pain/unresponsive)
Systolic BP	>90 mmHg/pulse palpable at wrist	90–50 mmHg/pulse palpable at groin	<50 mmHg (no pulse palpable)
Open Wounds	None	Minor	Major or penetrating
Skeletal	None	Closed fracture	Open or multiple fractures

A score of 7 or less mandates care in a specialized paediatric trauma unit.

Table 9.14 The APGAR score

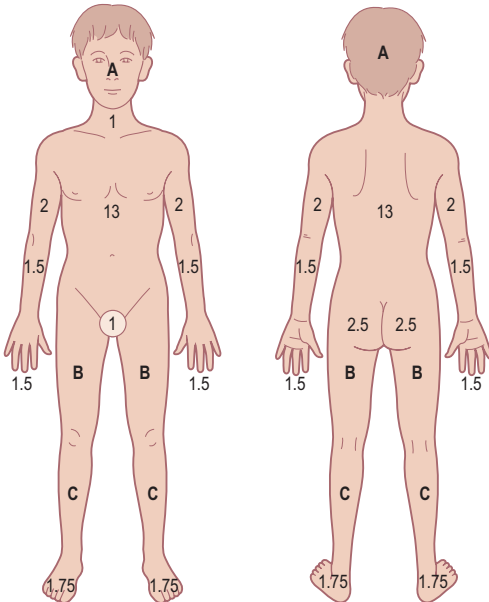
Sign/score	0	1	2
Heart rate	Absent	<100	>100
Respiratory effort	Absent	Weak, irregular	Good, crying
Muscle tone	Flaccid	Some flexion of limbs	Good flexion
Reflex irritability (suction)	No response	Grimace	Cough or sneeze
Colour	Blue, pale	Body pink, extremities blue	Completely pink

Apgar 1 minute – reflects need for resuscitation (<6 = birth asphyxia).

Apgar 5 minutes – some long-term prognostic value with regard to neurological outcome.

Lund and Browder Chart

The Lund and Browder chart (Fig. 9.4) is used to accurately determine burn surface area in infants and children of all ages. The relative contribution of head and lower limbs to total body surface area changes with increasing age, as is shown on the chart. The total burn surface area is obtained from the sum of each component area affected by the burn.



	A	B	C
2–9kg	9.5	2.75	2.5
10–18kg	8.5	3.25	2.5
19–22kg	6.5	4	2.75
24–30kg	5.5	4.25	3
32–48kg	4.5	4.5	3.25

Fig 9.4 The Lund and Browder chart.

Table 9.15 The base measurements and estimated weight from which the PAWPER tape is derived

Length (mm)	Weights (kg) for each Habitus Score				
	1	2	3	4	5
430 to 493	2.5	2.8	3	3.2	3.5
494 to 548	3.5	3.8	4	4.5	5
549 to 592	4	4.5	5	5.5	6
593 to 629	5	5.5	6	6.5	7
630 to 664	6	6.5	7	7.5	8.5
665 to 701	7	7.5	8	8.5	9.5
702 to 739	7.5	8.5	9	10	11
740 to 782	8.5	9.5	10	11	12
783 to 831	9	10	11	12	13
832 to 880	10	11	12	13	14.5
881 to 926	11	12	13	14	15
927 to 968	12	13	14	15	17
969 to 1006	13	14	15	16	18
1007 to 1039	14	15	16	17	19
1040 to 1070	14.5	16	17	18	20
1071 to 1100	15.5	17	18	19	22
1101 to 1132	16	18	19	21	23
1133 to 1165	17	19	20	22	24
1166 to 1206	19	21	22	24	26
1207 to 1254	20.5	23	24	26	29
1255 to 1296	22.5	25	26	28	31
1297 to 1333	24	26	28	30	33
1334 to 1366	26	28	30	33	36
1367 to 1398	27.5	30	32	35	38
1399 to 1432	29	32	34	37	41
1433 to 1465	31	34	36	39	43
1466 to 1498	33	36	38	41	45
1499 to 1531	35	38	40	43	47

This table can be used to estimate weight as long as the child's length can be measured with a regular tape measure. See [Chapter 4](#) for how to estimate the Habitus Score.

The PAWPER tape values

From [Table 9.15](#) one can estimate the child's weight, as long as the child's length can be measured with a regular tape measure. See [Chapter 4](#) for how to estimate the Habitus Score.

NB: Page numbers in *italics* refer to boxes, figures and tables.

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